

THE DENTAL PRACTITIONER

AND DENTAL RECORD

Including the Transactions of the British Society for the Study of Orthodontics, and the official reports of the British Society of Periodontology, the Glasgow Odontological Society, the Liverpool and District Odontological Society, the North Staffordshire Society of Dental Surgeons, the Odonto-chirurgical Society of Scotland, and the Dental and Medical Society for the Study of Hypnosis

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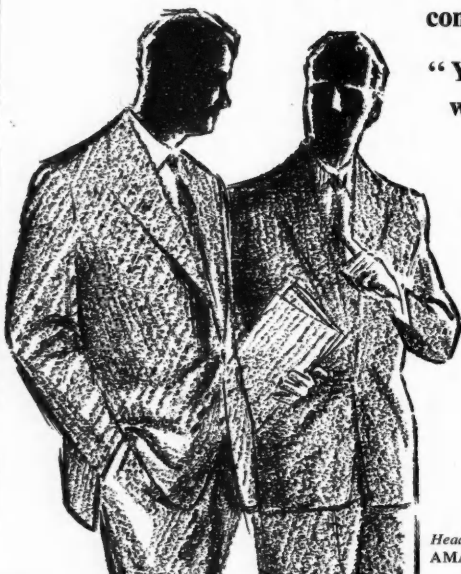
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THE DENTAL PRACTITIONER AND DENTAL RECORD

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EDITORIAL

DENTAL HEALTH INSTRUCTION

ONE of the main preventive measures in the control of dental disease is the instruction of the patient in Dental Health. It is, however, doubtful if this method is used to its fullest advantage. The dental surgeon has obviously very little time to spend with each patient to discuss habits of cleanliness or the question of diet. Advice is usually given as a series of "don'ts" while the patient is preparing to leave. Advice during treatment is not advantageous, as the patient concentrates just as much on the treatment as the operator and words merely go in one ear and out the other. The dental profession, unlike many other professions, is not paid directly for giving advice; it is only paid when we perform some tangible material act. We tend, therefore, to overlook this important work and rely on pamphlets and posters for informative patient instruction. Much valuable and important work has been done in this field by the Dental Board (now the General Dental Council) and the Ministry of Health. A new poster, "Sun and Moon", has recently been issued by the Ministry of Health, pointing out to children the importance of brushing the teeth both night and morning. The New Zealand Dental Association Council of Dental Health Education has always been in the forefront on this aspect of dentistry and has produced some

very valuable literature. They are to be congratulated on their recent pamphlets, particularly the one by Dr. G. N. Davies on *Dental Health—A Manual for Teachers and Nurses*.

However, it is not enough for the profession to sit back in the knowledge that all this is being done in the interests of the profession. We must participate actively in this work ourselves by being ready to explain as well as to display material on dental health. If life is too busy and hectic, then we should ensure that our chairside assistants are properly trained to engage in this work. It is a fact that many patients tend to ask the dental nurse questions on dental health. Here is an important person who always seems to be left out of our calculations. There is a tendency to think that her sole duty is to look after dental instruments while her real duty should be to look after dental patients. They should all be carefully instructed in dental health education and used to a much fuller degree. They are a valuable agent in this field of health and should be ready and able to instruct and advise on preventive dentistry and relieve the overburdened dental surgeon. Our duty does not finish when we place all the available literature in the waiting-room—it is only just the beginning.

A TECHNIQUE OF GINGIVECTOMY

By ADRIAN COWAN, M.B., B.Ch., B.Dent.Sc. (Dubl.), F.D.S. R.C.S. (Eng.)

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GINGIVECTOMY is beginning to find its proper place in the treatment of periodontal disease. It is no longer described as a "last resort" in treatment, nor is there as much disagreement about the merits of gingivectomy as opposed to curettage; instead, gingivectomy is accepted as one of the constituents of an overall programme for the patient, used in combination with, or instead of, other constituents as the signs and symptoms may direct.

This paper sets out only to describe one technique of gingivectomy which has given satisfactory results in the author's hands, to point out its advantages, and to give some general guide to indications.

Judgement is coloured by personal clinical experience and capacity, so that there is much variation in opinion as to the indications for gingivectomy. No fixed rules can be laid down which will satisfy everyone, but the inter-dependent governing factors which should influence the final decision are covered under the following broad headings:—

1. General Oral Condition.—The presence of sufficient and adequate teeth, or teeth which can be made so. Goldman, Schluger, and Fox (1956) draw attention to the greater value of certain teeth such as canines, first molars, and second premolars, because of their firmer attachments and key positions in the arch.

2. Co-operation.—More periodontal treatments fail through lack of co-operation than for any other reason. Hence the patient who has always had extractions in preference to restorations, who rarely cleans his teeth, or who is indifferent about his appearance, is a potentially poor subject for the rigorous system of massage and hygiene which will follow gingivectomy.

3. Pocket Depth.—Pocket depth is the clinical sign *par excellence* of advanced periodontal disease, but its importance in gingivectomy is related to bone level and the presence or absence of local causative factors. With a local factor such as traumatic occlusion,

a tooth may be held quite firmly in spite of a very deep pocket and only a small amount of bone-housing; while in a disease of systemic origin like periodontosis, most of the bone-housing can be destroyed and the tooth loosened before a pocket of any depth is detectable clinically. The difference in results of gingivectomy in these two—admittedly—extreme cases would be immense.

The removal of a local cause thus enhances the prognosis, and if contour can be more readily restored even with very mild pocketing (say 3 mm.) by gingivectomy, for example after recurrent "chronic" Vincent's infection, then it should be carried out without hesitation. In other words it is not necessary to wait for a certain depth of pocketing before surgery is justified; the contour and symmetry can be equally strong indications, and the operation is more correctly termed "gingivoplasty" in such cases.

4. Anatomical Form.—The work of Henry Goldman (Goldman, Schluger, and Fox, 1956) in Boston has brought out the importance of the contour of the tooth surface and gingival attachment in relation to periodontal disease. He has demonstrated how the convexity of the labial or buccal surface of the tooth deflects food during mastication from the knife-edge of the coronal limit of the attached epithelium in the ideal form, and he has demonstrated that every possible step is justifiable surgically and prosthetically to develop this ideal relationship in actual or potential periodontal disease. To this end he has evolved the procedure of osteoplasty, the shaping of the underlying bone to allow the gingiva to hug the neck of the tooth more accurately and to provide better sluiceways, wherever bone thickness has been the cause of a bulging gingival attachment. Further, he has advocated the planing down of the thickened epithelium at gingivectomy to facilitate the knife-edge still further, using diamond stones or the edge of the scalpel. In the technique to be described a similar

procedure is carried out with the electro-surgical unit, but the osteoplasty will not be discussed at this time.

5. Bone Level.—In the final analysis the level of the bony housing will determine the rigidity of the tooth, by which in turn the treatment will ultimately be judged. A minimum of half the root encased in bone is a reasonable goal, however arbitrary, but this is freely adapted to much smaller amounts if the tooth is only slightly loose, the housing on the majority of the dentition within the limit set out, and the rest of the governing factors favourable (e.g., adequate key teeth, good hygiene and co-operation, and controllable local factors present). Radiographs show that surprisingly little bone will hold a root firmly, but for æsthetic purposes as well as strength, the more bone the better, because the epithelium maintains a physiologically determined distance from the alveolar crest.

One would suggest that the words of Grossman in another context be remembered in relation to the very (Grade 3+) loose tooth: "... in our efforts to save teeth, let us not forget some are beyond salvation"

6. Occlusal Adjustment and Splinting.—Like scaling, occlusal adjustment and temporary or permanent splinting are essential components of periodontal treatment, and are carried out at the appropriate stages if required. Each contributes to the result of the other, and all to the final result.

7. Age and General Health.—Allowance is made for natural bone recession with age and likewise for slower healing. Clearly no surgical treatment should be undertaken if there are indications that the general health might suffer—for example from bacteraemia—with-out adequate precaution and consultation with the patient's medical adviser.

OPERATIVE PROCEDURE

The aim of gingivectomy is the elimination of pockets and the return of the tissues to as near the ideal normal form as possible, having special regard to the thin bevelled free-edge of the gingival attachment which should lie as a knife-edge closely in apposition to the cervical margin of the tooth. It is stressed that this

operation is not a cure for periodontal disease, it halts the condition at the stage at which it is encountered.

The technique to be described has been modified by the author over a long period to include those features which have, in his hands, given the most satisfactory results.

1. Anaesthesia.—Very great importance is placed upon anaesthesia because the whole success of the technique depends upon the reduction of the surgery to two painless sessions, one jaw being completed at each. The greater the number of visits for surgical treatments, the greater the patient's dread of the next one, however little he is hurt—one might call it a "summation of worry".

A local anaesthetic technique is required for this method which will cause as little discomfort as possible during its induction, considering the large area involved, and in which minimal dosage can be employed with maximum diffusion mesiodistally. Small quantities of anaesthetic cause less mechanical displacement and distortion of the tissues, less after-pain, and less chance of unpleasant side-effects such as fainting. In the dosage described here, procaine is ineffective, but xylocaine (Astra) 2 per cent with adrenaline 1-80,000 has been found to fulfil all the requirements.

2. Technique.—

Upper Jaw.—Three injections of 0.25 ml. are made in the buccal sulcus on each side, opposite the second molar, between the two premolars, and opposite the second incisor, the needle being inserted in the long axis of the tooth and the periosteum sprayed but not engaged, thus avoiding pain. Five more injections of a few minims each are made in the palate opposite the second molars, between the premolars, and in the incisive foramen. For these eleven injections the total is little more than 2 ml.

Working anaesthesia develops in less than 80 seconds and so intrapapillary injections of a few minims each can be made painlessly at once into each papilla to deepen the anaesthesia and control bleeding.

Lower Jaw.—The lingual surface is anaesthetized by infiltration of a few minims in the floor of the mouth at each side opposite the

molar and canine regions, because in this way the tongue is not affected to the extent encountered in a mandibular block. The buccal surfaces are anesthetized by bilateral mental blocks of 0.5 ml. each; if more rapid recovery from anesthesia is required 0.25 ml. will be adequate and equally efficient (Cowan, 1956).



Fig. 1.—Pyorrhea simplex before treatment.

Each dose covers the area $\overline{6|6}$ in $1\frac{1}{2}$ minutes; papillary injections are added as before and extended back two more on each side to cover $\overline{8|7|8}$ if required. The total anesthetic volume is 1.5–2.0 ml. This is a better arrangement than bilateral mandibular blocks which produce a completely uncontrollable tongue, cheek, and lip, are more painful to administer, require far more anesthetic (3–3.5 ml.), and last much longer (3 hr.) than the minimal dose mental blocks ($1\frac{1}{2}$ hr.), so that there is less chance of lip biting, particularly as xylocaine appears to affect motor-nerves less than procaine.

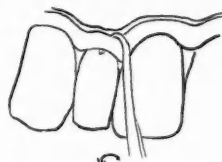
3. Incision.—To overcome the awkward angles involved in gingivectomy innumerable cutting instruments have been devised. In this technique the buccal and labial incision is made with a standard scalpel, using a No. 15 Bard-Parker blade, in a continuous symmetrical incision which curves suitably over each tooth and cuts as nearly at a 45° bevel as possible. The interdental papillae are then cut through by means of the arrow-shaped blade of the Monahan-Lewis knife, which is inserted deeply into the original incision at each interspace and rocked from side to side. This highly adaptable instrument is also used alone for the lingual and palatal incisions by inserting it in

each interspace, and rocking it from side to side so that all these cuts join to make a straight incision as described by Fish (1941).

When a finger is straightened out the loose skin on the extensor side of the joint is compressed into well-defined folds. In his description of pyorrhea Fish showed that a similar type of fold, or roll, is seen on the surface of the gingiva in pyorrhea simplex, brought about by the hinge movement of the detached gingival epithelium which forms the wall of the pocket. (Fig. 1.)

This fold is a valuable guide for the incision line, and after the pockets have been measured they will usually be found to extend to the level of this “roll”. In such cases it is necessary only to mark on the gingiva with a Crane Kaplan pocket marker the depth of such pockets as do not conform to this level and to follow the apical boundary of the “roll” with the scalpel, inserting the blade at as nearly an angle of 45° as possible to provide a bevelled cut.

Symmetry in incision will produce an early æsthetic result, and to this end certain modifications in the depth of the cut are not



* Fig. 2.—Cleaning tags with scaler.

only permissible but desirable. Suppose for example that all the pockets are of even depth except for two much deeper pockets at $2|2$ region; an incision to the very base of the deep pockets will produce a most unsightly “notch” in its continuity, and will also expose more of the roots of these small anterior teeth. In such circumstances it is better to carry the incision at this point half-way between the level for the other pockets and the actual pocket base, leaving behind, say, 2 mm. of the deeper pocket. Careful curettage at the time of operation will produce reattachment very readily, resulting in a greatly enhanced contour, probably because the protective pack is

supported by the neighbouring interspaces and the clot is not displaced.

Waerhaug (1955), as a result of experimental gingivectomy on dogs, has shown that any deepening of incision or curettage below the bottom of the clinical pocket is done at the expense of healthy periodontal membrane, and leaves the post-operative level of the sulcus apical to the pre-operative pocket. He suggests that, since the epithelium re-forms to a normal sulcus level after successful gingivectomy anyway, it might be better if the incision in all cases stopped about 1 mm. short of the bottom of the clinical pocket.

When the incision is complete, a sickle-shaped scaler is used to separate the small fibrous tags which may remain out of reach of the smallest blades, and which prevent the smooth stripping of the cut area. It is by no means essential that the cut area should be stripped in one piece, but it is a lot more convenient if possible since one link pulls the



Fig. 3.—Insertion of packs with tweezers and probe.

next one out, and so on. The blade of the scaler is inserted diagonally across each interspace and twisted smartly in an arc around its tip. This snaps the cutting edge through the tags and breaks them (*Fig. 2*); the detached strip of gingiva is then removed with dissecting forceps and scaler.

4. Scaling.—It is fully conceded that in many cases of periodontal disease, thorough scaling and hygiene will be sufficient treatment. It should, therefore, clearly be understood that when subgingival scaling is

recommended at operation stage, as it is now, this deferment applies only to those cases in which, in the operator's judgement, gingivectomy is definitely the treatment of choice.

A supragingival pre-operative scaling is used to clean up the mouth and remove gross



Fig. 4.—Same Case as Fig. 1 immediately after removal of upper pack and insertion of lower pack.

debris, and then, at operation, when the redundant gingival tissue has been stripped away, and the remaining gingiva becomes "subcalcular", easy and painless access is available. The curvature of the teeth makes the interdental space greater at this level and quite large heavy scalers can be used to great advantage. Any calculus which may be overlooked will still be free of the new gingival margin, and can be removed without touching that margin in the following week or two when massage has been established.

During the curettage fragments of epithelium separated by the electro-surgical unit are also swept away leaving a firm, clean bleeding surface, but care is taken that the curettage shall not reach deeper than the incision except where reattachment is sought for deeper pockets as described above.

5. Electro-surgery.—The MS5 unit described by Trotter (1951) is a high frequency short-wave unit with monopolar electrode. The present writer used it with great enthusiasm about six years ago as the sole cutting instrument for gingivectomy.

Rapid healing and remarkable control of contour were its outstanding features in a series of 25 cases in which careful notes were

kept, but there seemed to be rather more after pain, the smell was objectionable, and in the thinner type of gum-tissue the cut surface was friable and difficult to strip away.

Gradual experience has, therefore, led to a modification in its use which makes the best of both worlds and it is now used in this



Fig. 5.—Same Case. Upper jaw after one week of massage and lower jaw immediately after removal of pack.

technique to improve bevel, festooning, and contour of the scalpel incision, and to eliminate small inaccessible interdental tags.

Using the point and shank of the electrode in much the same way as a hot wax knife on wax, but taking care to keep the instrument smoothly in motion at all times to avoid any burn, the curvature, especially around the small necks of the lower incisors, can be reproduced better with this instrument than any other. Similarly the thickened coarse type of epithelium which is often seen, and which is incapable of really close approximation to the cemento-enamel junction, can be thinned and shaped in this way. Cut-tissue fragments are then swept gently away with a scaler.

6. Packing.—When the cleaning is complete, packs are inserted to protect the cut surface, reduce pain from operation and later trauma, and prevent overgrowth of epithelium. The packs preferred are based upon those described by Fish (1944) and are composed of cotton-wool from the inner portion of standard cotton-wool rolls. They are arranged in pieces about $\frac{3}{4}$ – $1\frac{1}{2}$ in. long, the central portion being teased out to about $\frac{1}{4}$ in. in diameter, and the ends twisted into tails. The paste is a creamy

mix of zinc oxide and eugenol and the packs are inserted as follows:—

A pack is dipped in paste, and one tail is inserted into an interspace with a tissue tweezers and blunt probe of the "curly" variety (Ash No. 12). It is locked there by the tweezers held in the left hand, while with the probe the other end is packed gently into the next interspace, the belly of the pack lying around the cervical margin.

The first tail of the next pack is inserted into the same interspace as the second tail of the first pack, and continued into the next interspace and so on until the entire buccal surface is complete. (Fig. 3.)

Then, using counter pressure with a finger buccally as each new tail is inserted, the lingual packs are placed in the same way. When all packs are in position they are squeezed firmly bucco-lingually at each interspace to encourage the paste to flow through and form into a stud so that the packs bind as the cement hardens. Finally, with a wet cotton-wool roll the packs are pressed firmly against the gum margin by sliding them along the surface of the tooth.

This "streamlining" makes displacement by food less likely. (See Fig. 4, lower jaw.) It has not been found necessary to cover the pack with any jelly or lubricant, but it is a wise precaution to pull the lower lip up and to either side while the paste is still soft so that the frænum will mould away any pressure-points on it, which otherwise can cause a painful ulcer.

The patient is instructed to brush the unaffected jaw in the usual way, but only to wipe over the parts of the teeth not covered by packing in the other jaw. A mixture of toilet soap and hydrogen peroxide (10 vol.) is used, and frequent mouth-washes with a pleasant-tasting antiseptic are advised to counteract the unpleasant taste from the pack toward the last few days.

Simple analgesics are used for after-pain from the operative treatment, and the patient is warned that while there will be little or no pain he will experience some discomfort, and that he should avoid hard foods for a week. If any pack comes out, he is told to report

again, unless it happens on the sixth or seventh day. When the pack is removed after 7 days the cut surface presents either healthy granulation tissue or early epithelialization.

No scaling, except removal of some of the black stain from the packs, is attempted and



Fig. 6.—Same Case. Four weeks post-operative.

the patient is introduced to the massage technique. The massage is designed to stimulate every part of the marginal gingiva to promote keratinization of its surface and to break down the nucleus of calculus formation. (Fig. 4.)

Standard balsa-wood points are used, such as "Interdens", and the technique is first demonstrated to the patient using two fingers to represent teeth, repeated in the patient's mouth, and then attempted with a mirror by the patient. It is explained that bleeding and discomfort will clear up in 3-7 days if he follows the routine correctly, and to assist in the early stages he is encouraged to lubricate with soap the wooden points, or the pipe cleaners which are used for bifurcation and trifurcation involvements, or very wide spaces, to reduce irritation on the raw surface.

He is given a strict routine of 40 strokes per space once a day on the grounds that this is better than 3 or 4 half-hearted sessions. A clear-cut instruction such as a definite number of movements is more likely to be adhered to than massage for a given period of time, and the strokes are broken down to four movements, two diagonals, one through and through, and one cervical.

After 7 days of massage a check is made, the patient examined, any remaining calculus cleared away, and any faults in massage technique corrected. Further checks are made the following week, fortnight, and month, and then three six-monthly according to the patient. If results are good, the patient should



Fig. 7.—Same Case. Final result eight weeks post-operative.

be encouraged and praised and no opportunity should be lost to emphasize the importance of continuous massage to replace the friction of dietary factors lost in the modern cuisine; any tendency to slacken off must be counteracted promptly. (Fig. 5.)

For the first 2-3 weeks after operation, a soft nylon brush is used with a hydrogen peroxide-toilet soap mixture, strict instructions on its thorough use being given. This brush is softer than the old badger-hair brush, and the mixture reduces surface tension and foams into the interspaces.

Later, this is replaced with a medium bristle short-headed brush and toothpaste is re-introduced, mixed with a little soap, because most toothpastes nowadays appear to contain too little of this valuable ingredient.

High dosage vitamin C is another worthy adjunct in doses of 400 mg. ascorbic acid daily for 10 days, followed by 200 mg. daily for a further month. This is to expedite recovery of the mesodermal tissue involved in the healing, a subject on which it is hoped to enlarge in a further paper.

The second stage of the operation is carried out one week after the first, on the same day as the first packs are removed (see Fig. 5) so that

the whole operative procedure is complete in 8 days, and a similar procedure is followed when these packs are removed.

ASSESSMENT

The test of a good result is made after 4-8 weeks. (Figs. 6 and 7.)

1. Blanching of the gingival margin when the tip of a probe is applied to the gingival sulcus, demonstrating a pocket depth of 0-1 mm.

2. Pink firm gingiva, evenly keratinized with no areas of deeper colorations.

3. Absence of calculus, any inflamed area, pain, and bleeding.

4. Good sluiceways and æsthetic contour.

Mobility changes, temporary splints, and selective grinding as required are co-ordinated at appropriate stages before, during, and

after gingivectomy, and are adjusted further in subsequent follow-up examinations.

It goes without saying also that all restorations must be inserted and faulty fillings corrected or replaced before any hope of periodontal success can be entertained. Even in these enlightened days there are still patients who may feel it more economical in the long run to have dentures, and while we must try to persuade them to keep their teeth, the æsthetic results must be compared and explained honestly.

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INTRA-ORAL ADDITION OF NEW CLASPS TO ORTHODONTIC APPLIANCES

By JOSEPH ANGELMAN, H.D.D., L.D.S.

THE increasing use of removable orthodontic appliances presents the problem of repair to fractured retention clasps. The type most commonly used is the modified arrowhead or Adams clasp.

If fracture occurs near the insertion of the lateral arms into the acrylic baseplate, soldering becomes impossible, and the clasp has to be replaced by a new one, which requires the taking of an impression for the necessary laboratory procedure. This is time-consuming, and usually requires a second appointment for refitting which can present difficulties with patients who have to travel long distances.

The following is a method of immediate replacement which has been successfully employed over the past two years. A series of prefabricated clasps are constructed on varied sized molars, premolars, canines, and incisors, although the majority used are molar clasps. One is selected and adjusted to fit the tooth,

the palatal or lingual extensions being just free of the soft tissues. The fractured clasp is cut away from the appliance with sufficient acrylic to allow the palatal or lingual extensions to be free.

The tooth and soft-tissue area is dried and covered with a thin layer of "Vaseline". The clasp is replaced on the tooth, and self-polymerizing acrylic added to the corresponding area of the appliance, which is refitted and held firmly in position. Excess soft acrylic is trimmed away, and polymerization hastened by applications of cotton-wool tampons soaked in comfortably hot water. When the acrylic has hardened the appliance is removed, trimmed and polished, and the final adjustments made to the clasp to ensure a snug fit.

The time factor involved is approximately 10 minutes, and solves a recurring problem in orthodontic practice.

VARIATION IN TOLERANCE AND PARTIAL DENTURE DESIGN*

By ROY STORER, F.D.S. R.C.S.

Department of Prosthetics, School of Dental Surgery, University of Liverpool

ON considering the subject-matter of this report it was thought perhaps advisable to make sure of the definition of the word "tolerance". The *Oxford English Dictionary* was therefore consulted and it is interesting to

important are those shown in *Table III*. Pain can be eliminated from this discussion as that cause should be easily remedied.

The degree of tolerance varies from patient to patient, and it is extremely difficult to assess

Table I.—RESPONSE TO RECALL OF PARTIAL DENTURE PATIENTS

Number recalled	Number who finally attended	Per cent
951	566	59.5

quote the first definition given: "the action or practice of enduring or sustaining pain or hardship". One is hopeful that patients tolerate removable appliances without necessarily fulfilling the requirements of the definition.

For the purposes of this paper a survey was carried out on all those patients who have had

Table II.—ANALYSIS
Partial Dentures

Type of Denture	Number
Simple acrylic tissue-borne	317
Nylon tissue-borne	2
Chrome-cobalt skeleton design	236
Skeleton design using other metals	11
Total	566

Chrome Alloy Dentures (Kennedy classification)

	Class I	Class II	Class III	Class IV	Total
Upper dentures	11	21	52	13	97
Lower dentures	57	42	36	4	139
Total					236

removable partial dentures constructed at the Liverpool Dental Hospital during the past four years. These comprised both acrylic simple tissue-borne dentures and metal dentures—the majority of the latter constructed in chrome-cobalt alloy (*Tables I and II*).

The causes of intolerance may be many and varied and it is considered that the most

Table III.—CAUSES OF INTOLERANCE

	Mental Attitude
	—Low I.Q.
	—Lack of Dental Education
	—Phonetics
	—Aesthetics
Intolerance	—Poor Retention
	—Instability
	—Discontinuity of Surface
	—Low General Resistance
	Pain

exactly how the patient will react to the partial denture and its various component parts. Not the least important factor is the mental attitude of the patient. The philosophical and exacting minds of House's Classification are those that are likely to be tolerant to the denture design advocated by the surgeon, whilst the hysterical and indifferent patients are those who will complain about everything, tolerate nothing, and give no credit whatsoever to the surgeon who is trying to follow De Van's (1952) exhortation that "the perpetual preservation of that which remains is to be preferred to the meticulous replacement of that which is missing". In such cases the most simple form of acrylic tissue-borne denture designed on as hygienic lines as possible is the only denture that is likely to be appreciated by the patient.

Patient education is of the utmost importance—the discussing of a partial denture design with him is likely to enhance the patient's tolerance because he will then be aware of the significance and necessity of the various component parts. Side by side with

* A paper read before the British Society for the Study of Prosthetic Dentistry, April, 1957.

education will naturally be the intelligence of the patient. Anderson and Lammie (1952), in their survey of partial dentures, commented on this when comparing dentures constructed at the Birmingham Dental Hospital with those constructed in private practice—a much greater proportion of the latter patients were conscious of the need for the denture and their degree of tolerance was consequently higher.

The general health and resistance of the patient will play a part in the possible reaction to the partial denture. For example, the female patient at the menopause may suffer from a desquamation of the oral epithelium and be unhappy with any appliance that covers the easily traumatized mucosa. Similarly, a chronically sick patient may not have the will-power to get over any difficult transitory period. An example of this is illustrated in the writer's experience with a patient who suffers from lupus erythematosus. On occasion this patient's general resistance is very low and she is unable to tolerate the partial denture in her mouth although at other times her tolerance to the denture could not be better.

The tolerance of the average patient will depend on his ability to accommodate to the various component parts of the denture and to the denture as a whole. There must be complete comfort and the patient must be able to carry out all normal functions associated with the oral cavity. The denture must tend in effect to become a part of the patient. As a general principle, wherever possible, the lines of the saddles, the bars, the retainers should be continuous and flowing in sweeping curves—curves are far less noticeable to the tongue and soft tissues than sharp angles. It is the tongue that is the cause of much of the trouble with regard to patient tolerance and design. Skeleton dentures are frequently described as "dentures with holes in them"; the more holes there are, the more likely is the tongue to find them and become irritated in both meanings of the word. Continuity of surface and simplicity must always be the aim of the designer of a partial denture. The simple design is far better tolerated by the average patient than the complex one.

It would seem desirable to break up the partial denture into its various components and consider the patient's reaction to each with particular reference to the intolerable features of poor retention and lack of stability, æsthetics and interference with phonetics, and delve further into the effect of discontinuity of surface.

DIRECT RETAINERS

If a denture is not adequately retained then the patient will be embarrassed during speech and mastication; the majority of partial

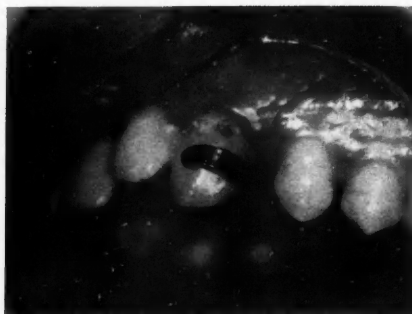


Fig. 1.—Wrought metal clasp displaced to show cervical caries.

dentures do in fact require some form of direct positive retention. Clasps which are the conventional form of direct retention may be intolerable to the patient for reasons of lack of efficiency, formation of stagnation areas, irritation of gingival margins, and a poor æsthetic effect. Clasps are effective retainers providing the correct clasp using the most suitable alloy is chosen for the right tooth. The majority of clasps these days are cast—the wrought plate clasp is certainly obsolete for obvious reasons of inefficiency, poor æsthetics, and a greater danger to the tooth structure (Fig. 1). Without doubt the gingivally approaching long-armed clasps—the Roach and the De Van—are potential trouble-makers with regard to food-packing, stagnation areas, and irritation of the gingival margins. The majority of patients do *not* find such clasps self-cleansing, and the continual collection of food debris is frequently a source of annoyance. It was originally advocated that the long-arm

Roach clasp (Fig. 2) was preferable to the shorter-armed circumferential clasp where chrome-cobalt was the alloy of choice, because of the lack of resilience of the chrome alloy. With variations in melting techniques, such as reduction of the amount of acetylene used with consequent reduced carbon pick-up by the



Fig. 2.—A Roach T-clasp causing irritation of gingival margin.

alloy, a more resilient alloy can be obtained and hence the more compact circumferential clasps can be used safely even on premolars. These clasps are, of course, well tolerated with regard to cleanliness and if carefully designed will be almost completely self-cleansing.

Clasps may frequently provide an aesthetic problem; tooth-coloured nylon clasps have proved unsatisfactory as has a method of covering the metal clasp with acrylic resin. Neither patient nor surgeon is happy if a denture is inserted where metal components are all too obvious. Often in an endeavour to give as good an appearance as possible the technician places the clasp too close to the gingival margin with consequent gingival irritation. The joint problem of retention and aesthetics is found particularly with the upper bilateral free-end saddle case. Gold is often tolerated aesthetically better than chrome, but is not always a satisfactory answer to the problem. Frequently the best solution is to design a simple tissue-borne denture. Unfortunately this does not always give adequate resistance to both anteroposterior and vertical displacements and without such resistance there is neither comfort nor tolerance. In such cases the writer makes use of Turkheim

retainers (Fig. 3) which provide the necessary resistance to displacement and are acceptable aesthetically (Turkheim, 1952). The number of clasps used should be cut down to the minimum compatible with adequate retention and they must at all times blend with the tooth contour.



Fig. 3.—Turkheim retainers.



Fig. 4.—A Rustch anchor positioned between 5 and 6.

Spoon dentures are generally well tolerated by the young patient—where this is not the case, then some form of cribbing is necessary to give positive retention. The writer obtains positive retention in these cases by making use of the Rustch anchor (Fig. 4). These anchors are also made use of in the adult patient with an anterior saddle where a simple form of denture is indicated. Generally speaking, where upper saddles are so positioned that to obtain direct retention it is necessary to clasp teeth that would give an aesthetically poor result, then in the absence of internal attachments it is usually preferable to use a simple tissue-borne acrylic denture.

INDIRECT RETAINERS

As an example of an indirect retainer the continuous clasp can be one of the most annoying and irritating components of the denture to the patient, but there are occasions when it is necessary to make use of it. Some patients find it completely intolerable, others



Fig. 5.—Usual design of continuous clasp.

will complain of food-packing between the clasp and the lingual bar and yet tolerate it, whereas others will find the area completely self-cleansing. It seems certain that the type of continuous clasp that is tolerated best is the one that blends with the tooth surface, in other words that which maintains a *continuity of surface*. There has been a change, then, from Beech's original wrought-wire continuous clasp to the cast equivalent and now to the more modified form covering a greater area of tooth surface and contoured to simulate lingual contour of the teeth (Fig. 5).

The modified form may be criticized in that it is positioned close to the gingival margins—but if it is well designed the writer is convinced that the area is self-cleansing and the gingival margins subjected to normal stimulation; far more so than if food debris is packed between the continuous clasp, connecting bar and lingual bar.

With the rigidity of chrome it is often possible to use a modified continuous clasp as the major connector—thus obviating the need for a lingual bar—particularly where there is a history of poor lingual-bar tolerance or where there is insufficient room, as may occur following a gingivectomy.

CONNECTORS

With connectors a continuity of surface, a blending in with the tissues, is important. Connectors should be broad and thin rather than narrow and thick. With the lower connector, best tolerance initially by the patients is obtained with the acrylic lingual plate;

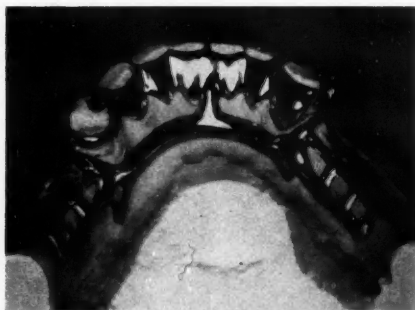


Fig. 6.—Modified continuous clasp.

tolerated perhaps but condemned by the teachers of prosthetic dentistry. The alternatives are the acrylic or nylon bar, the wrought or cast bar in metal, the metal lingual plate, and the metal buccal bar. The writer does not advocate the acrylic bar for reasons of lack of rigidity and strength.

The metal lingual bar is generally well tolerated provided it is contoured to blend in with the tissues and is clear of the moving tissue of the floor of the mouth. All bars at the Liverpool Dental Hospital are cast in chrome even for the simplest form of denture because with the better adaptation there is undoubtedly better tolerance. The half-pear shape is generally preferred to the half-oval or oval.

The metal lingual plate does give the continuity of surface and if the patient is intelligent and educated by the surgeon with regard to stimulation of the gingival margins, the reaction of the tissues to metal coverage is good. Coverage and continuity of surface are to be preferred where it is obvious that an area bounded by metal components will be non-self-cleansing. With the plate some effort should be made to simulate the lingual contours. If gingival margins are to be covered

these three rules should be followed wherever possible: (1) Occlusal or cingulum support; (2) Relief of the gingival margins; (3) Coverage with metal.

The buccal bar has much to commend both when it is necessary because of the instanding teeth and also where one has the choice of either buccal or lingual bars. It is extremely



Fig. 7.—The buccal bar.

well tolerated, is more self-cleansing, in the majority of cases is aesthetically acceptable, and in no way restricts the tongue space.

The upper connectors are probably more trouble to patients than the lower because they are more liable to interfere with phonetics. As a general rule anything crossing the palate should be as thin as possible and must merge into the tissue. Wherever possible the posterior bar is the connector of choice. One of the main difficulties here is the tendency for the bar to stand away from the tissue of the palate with consequent discomfort. This can usually be obviated: (1) by ensuring that there is proper retention of the impression material in the tray posteriorly and no tendency for it to hang down away from the tissue during setting because of excess weight; (2) by post damming; and (3) if necessary using an expanding stone.

Roth (1940) asserted that a palatal bar placed posteriorly to the premolar and preferably in a position connecting the distal surfaces of either the first or second molars would cause less change in the voice quality. Anterior and middle bars are not well tolerated as a general rule. The anterior and middle bars are

not as well tolerated; the former if not carefully contoured to follow the rugæ will undoubtedly affect phonetics and become intolerable to the tongue. The middle bar may well be a source of annoyance, particularly if the bar has had to be relieved over the central torus area. There is much to be said of course for the plate-connector in the upper jaw and

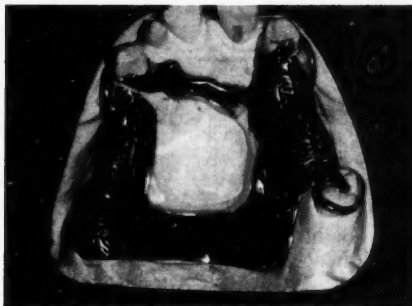


Fig. 8.—The anterior and posterior palatal bars.

the thin chrome palate is well tolerated. Where conditions are favourable, the side-plate design or the unilateral denture give most excellent results.

SADDLES

Saddles are likely to be a cause of intolerance if they interfere with movements of the peripheral tissues and the tongue. A particular source of irritation is likely to occur if the postero-lateral aspects of the tongue—the area of the foliate papillæ—are impinged upon by malpositioned teeth and saddles. Food-packing under saddles, most irritating to the patient, can be prevented by good sealing of saddle peripheries and regular inspection for possible rebasing.

The writer follows the views of Applegate (1955) on the preference for metal adjacent to the tissues. In the cases on recall there appeared to be a better tissue-reaction under metal saddles than under acrylic—and Applegate mentions the possibility that in the long stress-broken free-end saddles with potential good bone reaction to stress there is likely to be less resorption under metal coverage due to improved tissue tone.

Where the reaction of the alveolar bone underlying the saddle is likely to be poor, however, and the mucosa is friable, a suitable soft lining material will add much to the comfort of the appliance.

MATERIALS

The materials used in a partial denture base must be adapted to the characteristics of the tissues of the mouth. Thin metal is undoubtedly preferred as a connector to the thicker acrylic. The ability to keep it clean and to perceive temperature changes helps considerably in getting a favourable reaction from the patient—for the enjoyment of food is of paramount importance. Where palatal coverage has been indicated, a variety of surfaces of chrome have been tried, but most patients prefer the highly polished metal to one where there has been some attempt at stippling to simulate the mucosa. Taste with metal bases is not of very great significance. Thirteen cases out of 250 complained of initial metallic taste with chrome alloy; in 2 cases only did it persist longer than three months and as they were wearing the dentures it did not appear excessive or cause any worry.

Ylppö (1955) mentioned that different materials in prostheses might have some effect on the quality of the voice and its characteristic tone. The intensity of resonance depends on

the firmness of the walls of the resonating cavities and, therefore, metal palatal coverage, for example, may give more amplification than a resinous material. It would appear unlikely with partial dentures that the materials used would have any pronounced effect. As has been mentioned it is the positioning of component parts that can affect the voice and interfere with speech in general.

CONCLUSION

It would seem then that the patient's reaction to the denture, his degree of tolerance, will be determined by two main points: (1) his outlook and attitude to the treatment given; and (2) the care we take over design.

The accent of this paper has been the tolerance of the patient as a whole towards prostheses. It must not be forgotten, however, that the tolerance and therefore preservation of the oral tissues in particular must always be of prime consideration when the provision of partial dentures and their design are being considered.

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DENTAL RADIOGRAPHY

A TWO-DAY course in dental radiography has been arranged for dental nurses and assistants, to take place on Thursday and Friday, Oct. 23 and 24, 1958, at the Ilford Limited Department of Radiography and Medical Photography, Tavistock House North, Tavistock Square, London, W.C.1. No fee is charged for this course. Application forms will be sent on request.

BRITISH STANDARDS INSTITUTION

British Standard for Dental Chisels, Excavators, Probes, and Scalers (B.S. 2965: 1958)

THIS new British Standard specifies requirements for the design, materials, and methods of test of a range of chisels, excavators, probes, and scalers for use in dentistry. Copies may

be obtained from the Sales Branch of the British Standards Institution, 2, Park Street, London, W.1. 7s. 6d. (Postage extra to non-subscribers.)

THE BRITISH SOCIETY OF DENTAL RADIOLOGY

ON March 27 and July 28, 1958, representatives from the X-ray Departments of Dental Schools and Hospitals in the United Kingdom met at the Royal Dental Hospital, London, under the Chairmanship of Dr. Sydney Blackman, to form "The British Society of Dental Radiology". All those who are interested are invited to make application for membership to: Mr. Guy Poyton, F.D.S., X-ray Department, Eastman Dental Hospital, Gray's Inn Road, W.C.1.

THE RELATION OF OPERATIVE PROCEDURES TO THE HEALTH OF THE PERIODONTAL TISSUES*

By E. L. HAMPSON, M.D.S. (L'pool), F.D.S. (Eng.), H.D.D. R.C.S. (Edin.)

SINCE the general causes of periodontal disease are not fully understood, the attention of the dental profession must still continue to be focused on the local agencies which play such an important role in either directly establishing or accentuating this condition. It will be

interstitial surfaces of carious teeth, are only a few of the factors which will promote progressive destruction of the periodontal tissues. The dental surgeon who treats the effects of caries without regard to the periodontal tissues is failing in his duty to his patients, and his work will only be done well when he realizes that in operative dental surgery, although the basic laws of mechanics and engineering must be understood and adhered to, the objectives

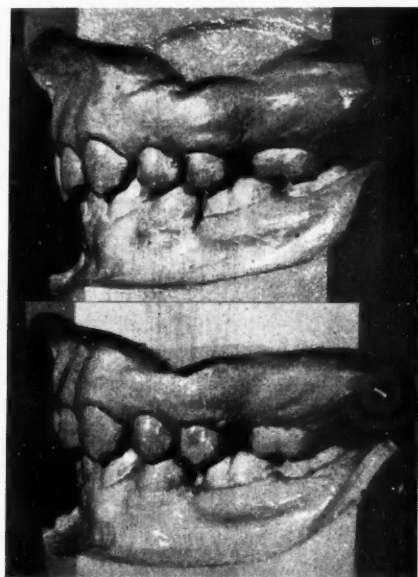


Fig. 1.—To illustrate rapid movement of teeth into the space left by an extracted tooth. Lower models show condition before the lower second premolar was extracted on Oct. 10, 1957. Upper model shows closing of the gap which was left by the extraction during the next four months. A movement of 2 mm. had taken place.

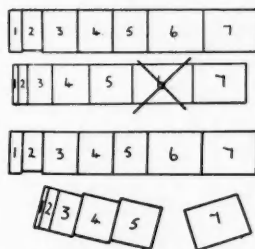


Fig. 2.—Diagrammatic illustration of effect of extraction of first permanent lower molar. (By kind permission of Messrs. White, Gardner & Leighton and Staples Press, Ltd.)

of his work are mainly biological. Therefore, the dental surgeon can do a good deal towards both encouraging and preserving the health of the supporting structures of the teeth, and the efficiency of his treatment in this respect should be judged by how well he restores contact points and tooth contour and how well he forestalls the ill-effects of loss of teeth.

One of the chief concerns of the dental surgeon should be the prevention of loss of contact between neighbouring teeth and the correct restoration of contacts which have been lost. Although interstitial caries is a common cause of loss of contact, one of nearly equal importance is the loss of individual teeth. Caries is usually well treated, but lost individual teeth in an otherwise intact dentition are rarely replaced. It is not often enough

generally accepted that, second to calculus, the effects of bad operative procedures are the commonest local causes of periodontal disease. Cervical ledges, failure to build adequate contact points, failure to restore occlusal and

* Given at the meeting of the British Society of Periodontology held on April 19, 1958.

realized that the teeth are kept in their axial alignment by their neighbours, and by their opponents in occlusion by the interlocking of their cusps during mastication. Therefore, every tooth must be regarded as of first

there is an increase in depth of the gingival sulcus and often a tendency to pocketing. Excessive mesial leverage caused by loss of mesial contact accentuates this pocket formation and destruction of bone. The elevated

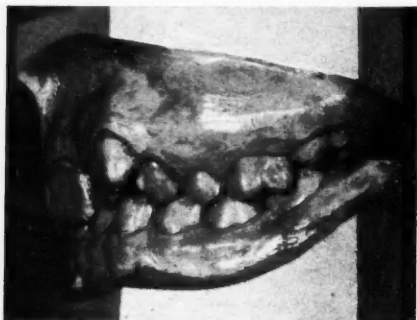


Fig. 3.—To illustrate the plunger effect of the raised distal cusps of the tilted lower second molar in the occlusal embrasure between the first and second upper molars.

importance in maintaining the correct relationship of the interstitial surfaces of the other teeth. Often when a tooth is lost the changes which take place are unimportant, while in other instances movement of those that are left begins immediately (Fig. 1). This movement is influenced by the state of health of the periodontal tissues and the amount of alveolar destruction. Thus if periodontal disease is present and considerable bone loss has occurred, the teeth drift rapidly so that serious derangement of the dentition results, which tends to accentuate the periodontal disease or help to establish it away from the site of loss.

The effect of non-replacement of missing teeth is perhaps best illustrated by the changes which follow non-replacement of the lost first lower permanent molar. Many abnormalities can be traced either directly or indirectly to this extraction (Fig. 2). After the first permanent molar has been lost the second permanent molar may tilt into the space left by the extraction. The forward incline on its mesial surface encourages stagnation in its cervical part and hinders the normal gingival stimulation caused by the food during mastication. Because the neck of the tooth is lowered

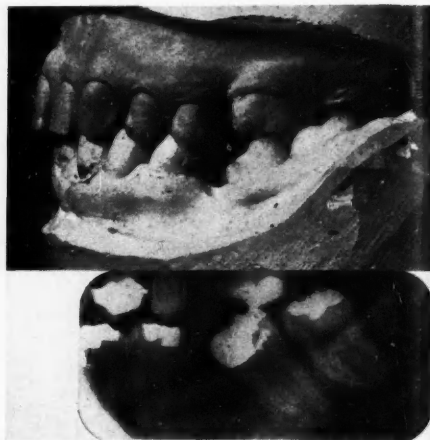


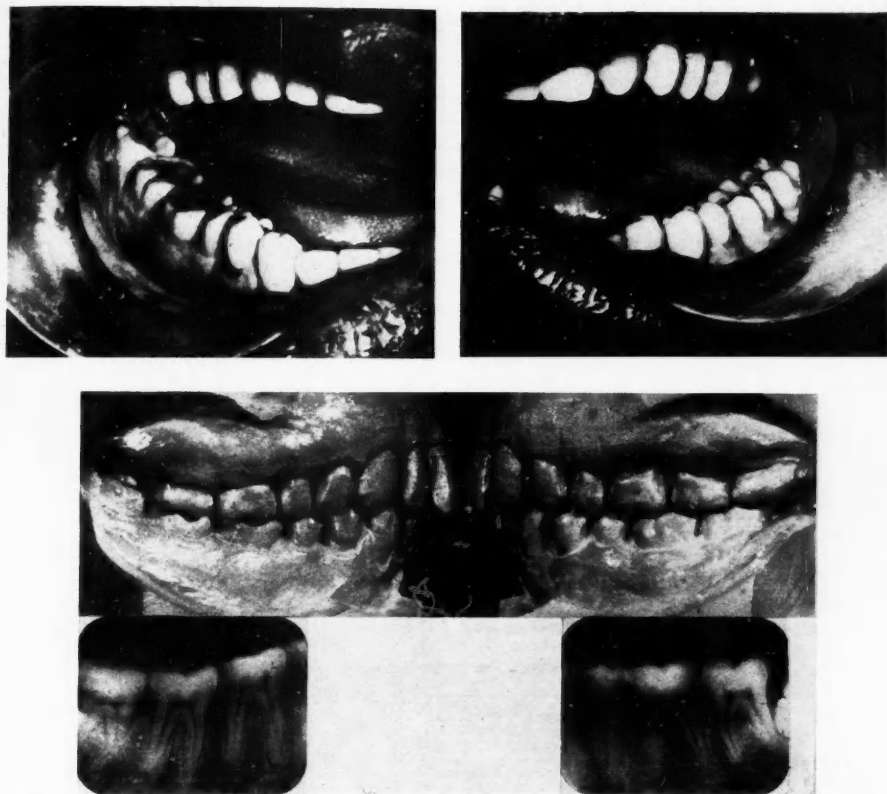
Fig. 4.—To illustrate the plunger effect of the distal cusps of the upper second molar into the occlusal embrasure between the tilted lower second molar and the tilted lower third molar. This condition promotes stagnation of food between the two teeth which leads to periodontal disease and dental caries. Decalcification of the mesial surface of the lower third molar, not apparent on the radiographs, had occurred.

distal cusps of the second molar act as plungers which tend to force food into the interdental space between the first and second upper molar teeth (Fig. 3). Also, traumatic occlusion results from the impact of the raised distal cusps of the lower second molar against the distal cusps of the upper first molar in forward movements of the mandible. The lower third molar also tilts forward to produce an accentuated occlusal embrasure between it and the second molar, which encourages food impaction and eventually dental caries and periodontal disease (Fig. 4). The discomfort which is sometimes experienced when the complications which have just been described have taken place may cause the habit of unilateral mastication which can lead, as it has done in some patients, to excessive attrition on the functional side, periodontal disease on the non-functional side, and possible pathological

changes in the temporomandibular joint (Figs. 5-7).

Another important cause of loss of contact is interstitial caries, which usually is more effectively treated than the conditions which have just been discussed. Since the pain

general use are efficient, and whether the thickness of the band is compensated for by the expansion of the amalgam and the pressure of packing. With this in mind a clinical survey and a laboratory investigation was carried out to take stock of the amalgam restorations



Figs. 5-7.—Illustrate the dental condition of a patient, aged 31 years, who had, so far as he could remember, not used the teeth on the left-hand side during mastication. The marked attrition on the right-hand side shows the effect of the unilateral mastication on the hard structure, and the radiographs show that greater bone loss has occurred on the non-functional than on the functional side.

which usually results from it draws the patient's attention to its presence, treatment for its relief and repair is more often sought. So that the original interstitial contours shall be properly restored, a good matrix technique must be used to provide the lost wall of the tooth. The writer has always wondered whether the matrix techniques which are in

which were done at the Sheffield Dental School and also to compare the efficiency of the matrix techniques in current use.

A clinical and radiographic survey of 200 Class II amalgam restorations was made and attention was particularly paid to the condition of the contact points, interstitial contours, and cervical overhangs, as well as to the health

of the periodontal tissues. Records of the clinical observations were made on charts (Table I) on which were recorded the condition and extent of the contact point, the type of

and that of the supporting tissues (Fig. 3). The contact points were examined with floss silk and the interstitial contours by radiographs. An analysis of the results showed that

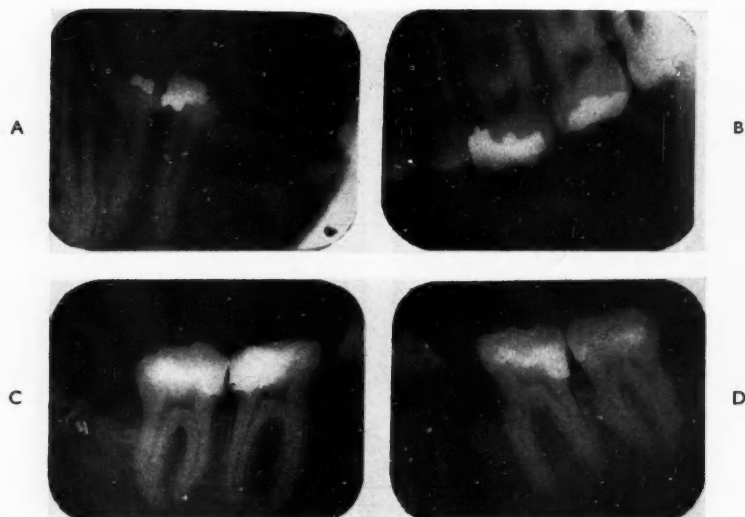


Fig. 3.—Sample of radiographs which were obtained during the survey. These illustrate the poor results which follow when matrix bands are not used (A, B), the cervical overhang resulting from not wedging the matrix band (C), and the improved cervical adaptation when the bands are wedged (D).

matrix which was used, whether a wedge was used, whether the band was contoured, and the radiographic appearance of the restoration

16 per cent of all restorations were not in contact with their neighbours. Since most of the restorations were done with the Ivory No. 1

Table I.—SURVEY OF CONTACT POINTS IN CLASS II AND CLASS III FILLINGS

NAME	AGE	REF. NO.	TOOTH	CONDITION OF CONTACT POINT TESTED WITH FLOSS SILK	X-RAY REPORT ON POSITION OF CONTACT POINT	X-RAY RESULT SHOWING ANY PATHOLOGY	EXTENT OF CONTACT POINT	DATE OF FILLING	WAS MATRIX BAND USED?	WAS SEPARATION OR WEDGE, AND HOW FILLING POLISHED	MATERIAL USED FOR FILLING
F. G.	30	006406	$\overline{7}$	Tight	Correct	—	2 mm.	1.2.58	Yes Ivory	Wedge Pumice ZnO + Alcohol	Amalgam
F. S.	35	061318	$\overline{7}$ M.O.H.	Tight	Medially high Distally high and flattened	Evidence of parodontal pocket distally	1 mm. 1 mm.	7.11.57	Yes Bonnalie	No wedge Pumice ZnO + Alcohol	Amalgam
B. H.	22	059371	$\overline{7}$	Tight	Too extensive flattened contact area	—	2 mm.	12.2.58	Yes Bonnalie	Wedge Pumice Whiting	Amalgam
P. B.	23	003295	$\overline{6}$	Tight	Contact area very flattened	—	2 mm.	1.6.57	Yes Ivory	No wedge Pumice ZnO + Alcohol	Amalgam
P. B.	23	003295	$\overline{7}$	Tight	Contact area very flattened	—	2 mm.	27.5.57	Yes Ivory	Pumice ZnO + Alcohol	Amalgam

matrix it is not surprising that 86 per cent of those deficient were packed with this matrix and 14 per cent with the Bonnalie matrix. When a wedge was used there was a detectable cervical overhang in 6 per cent of cases, but when a wedge was not used this rose to 18 per

cent. So as to confirm these clinical observations the logical sequel to the survey was a laboratory investigation, because although much research has been done to determine the physical and clinical properties of amalgam

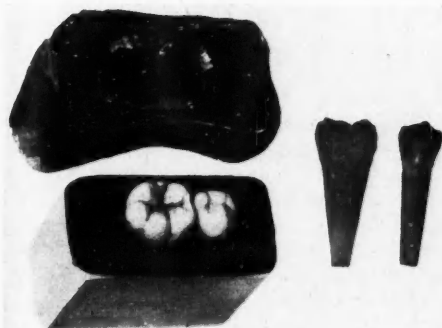


Fig. 9.—The two teeth mounted on a plaster block, the impression in rubber-base impression material, and the Marco-resin models.

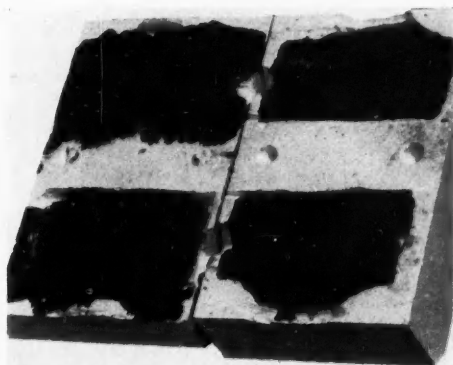


Fig. 10.—Moulds in rubber-base impression material for the models which were to be cast in the low-fusing metal.

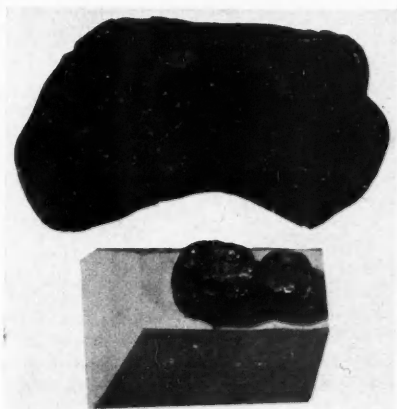


Fig. 11.—Metal models mounted on plaster block.

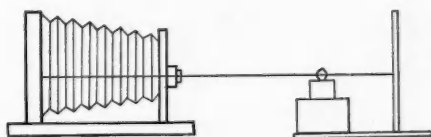


Fig. 12.—To illustrate the position of the camera in relation to the model while the photographs were being taken.

cent and the radiographs suggested that the extent of the overhang was considerably greater. Twenty-eight per cent of the fillings lacked occlusogingival contour, this pointing to the need to contour the band in most cases. Ten per cent of the contact points were obviously too near the occlusal surface, while the 8 per cent were too near the gingival area.

little attention has been paid to the matrix which is so important for its proper manipulation. Many methods of forming a matrix have been devised, but so far little has been done in this country to find out which are the most suitable ones. Work similar to the present investigation has been done by Phillips, Castaldi, Rinard, and Clark (1956) in America and the method used was similar to the one which Lasater (1940) used to observe the distortion of wax. It was pointed out by Phillips and others (1956) that Fee (1940) after examining the teeth of 1200 patients, came to the conclusion that teeth could be classified into square, ovoid, and tapering, according to their shape. While everyone may not agree with these conclusions, most will agree that in an

investigation of this type allowance must be made for variations, and that matrix techniques must be adopted to the kind of teeth which are being restored. So far in the present

cut and then two-part moulds of the two teeth were made (Fig. 10) in rubber-base impression material. It was now possible to obtain from these moulds an unlimited number of models



Fig. 13.—Plaster matrix held against the metal model while amalgam is being packed.

work only a lower second premolar which had a well-marked distal contour has been studied.

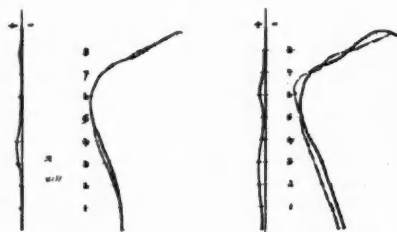


Fig. 14.—Images of standard model and that of one of the other specimens traced on to 1-mm. graph paper. The graphs which were made from these tracings are also drawn.

This tooth was set up with a first molar behind it in as near their normal position as possible on a plaster block and an impression of these teeth was taken in rubber-base impression material. The impression was cast in self-curing Marco resin and models of the teeth with root portions were made separately (Fig. 9). Into the occlusal and distal surfaces of the premolar a typical amalgam cavity was

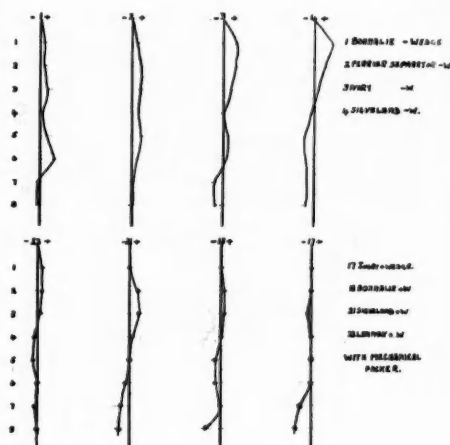


Fig. 15.—Graphs which show the degree to which interstitial contours have been reproduced with matrix bands without wedges, and matrix bands with wedges.

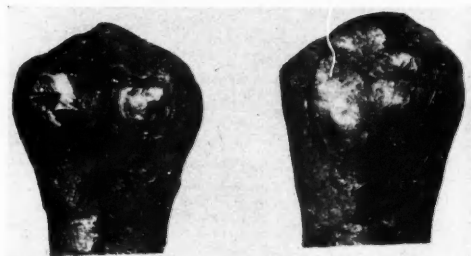


Fig. 16.—Profile photographs of the standard model and one of the other specimens in which a matrix band was used, but without a wedge. The excessive cervical overhang is very apparent.

of the molar and premolar teeth in low-fusing metal. Two of the models, after the root portion had been lubricated, were replaced into the original rubber-base impression material and mounted on a block of plaster-of-Paris. In this way the models were set up in the same relationship as that of the original natural teeth (Fig. 11). Also these models could be easily replaced by other similar specimens and

since the teeth were loose in the plaster-base slight separation could be obtained during the later experiments when amalgam was packed into the cavities in the models, using different matrix techniques.

When all the specimens had been obtained they were allowed to set and then silhouette photographs were obtained of them. The apparatus which was used consisted of a camera in a fixed position and a revolving turn-table upon which the specimen was placed (*Fig. 12*). The top of the turn-table had cut in it a recess into which the plaster block which held the specimens could be put in the same position for each experiment. While the photograph was being taken the model of the molar was removed, and by rotating the block different views could be obtained. So that comparisons could be made, a standard reference model was made by taking an impression in plaster of the distal surface of the original premolar tooth and using this as the matrix for one of the specimens (*Fig. 13*).

The negatives obtained for the different specimens were placed in turn into an enlarger which was adjusted to produce an image ten times the normal size. This image was projected on to 1-mm. graph paper, and the image of the reference specimen was outlined on the paper to be followed by the outline of one of the specimens in which the other matrix techniques were employed (*Fig. 14*). Two tracings, i.e., one of the reference specimen and one of the other specimens, were obtained for each method of manipulating the amalgam. These tracings made it possible to compare the deviation from the ideal which resulted from each method, and to make comparison easy the results were represented graphically by allowing a straight line to represent the control specimen and curves either to the positive or to the negative side of this ideal line the deviations of the specimens which were obtained from the different methods. Readings were taken at eight different positions along the interstitial surface of the specimens so that reference could be made to such positions as the contact point (position 6), the cervical margin (position 1), or the marginal ridge. It will be realized that the more closely the graph

coincides with the vertical line the more accurately is the original contour reproduced.

RESULTS

Analysis of the results showed that when the matrix band was just screwed on to the tooth without preliminary contouring or wedging there was poor reproduction of the original contour. In the contact-point area most of the



Fig. 17.—To show the use of a Ferrier separator to hold the matrix band in position, and to produce a small amount of separation.

specimens were slightly over-contoured (*Fig. 15*). The greatest deviation was in the gingival area, where the cervical overhang was 0.2 mm. for the Bonnalie matrix, 0.6 mm. for the Ivory No. 1, and 0.8 mm. for the Sigveland matrix (*Fig. 16*). The deviation below position 1 (*Fig. 15*) represented the cervical overhang, and a restoration showing a typical example of the possible extent of this overhang is shown in *Fig. 16*. When the wedge was used, but with a band which was still not contoured, there was a definite improvement with all retainers, but in general there was still over-contouring in the contact-point area (*Fig. 18*). There was but little cervical overhang when the techniques which employ the Ferrier separator (*Fig. 17*) and the one which is recommended by Markley (1951) were used (Markley reinforces the band with composition). Also, at the contact-point area good reproduction of the original contour resulted, but below this the contour failed to resemble that of the standard model. Phillips quotes Miller (1948) who claims that the use of an uncontoured matrix band produces a high contact. It was found in this investigation that failure to contour the band did cause the contact to be raised in occlusal direction in 80 per cent of cases and that when contouring of the band had been done there was a shift in position in one-third of the specimens. From this it can therefore

be concluded that in order to establish the contact point in its correct position contouring of the band is essential, as the best results were obtained when the matrix band had been contoured and wedged (Fig. 18).

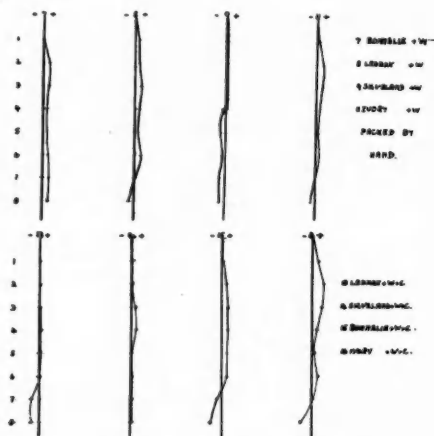


Fig. 18.—Graphs representing interstitial contours when wedges alone are used and when weighing and contouring is employed.

DISCUSSION

Although the report which is now being given is only an interim one, it is safe to conclude that in order to prevent cervical overhangs wedging of the matrix band is necessary and that the proximal contour can only be reproduced accurately if the band is contoured. Although excess amalgam below the cervical margin can be removed after the matrix band is removed, it is considered by many authorities that this can be dangerous and difficult to carry out satisfactorily. How difficult it is to carve amalgam free-hand in this inaccessible position will be seen by examining the graphs in positions above point six which are beyond the influence of the matrix band. Here the contours are only moderately well reproduced with much variation between the specimens. A further difficulty with this free-hand carving is possible damage to the amalgam and the drawing of mercury to the surface to produce an amalgam of poor quality which might harbour infection and encourage corrosion.

SUMMARY

The importance of replacing lost individual teeth has been stressed and the possible effects of failure to do this pointed out. Examples of the ill-effects which follow the non-replacement of the lower first molar have been given, with the suggestion that dental surgeons might be more conscious of the need of early treatment so that abnormalities of occlusion, caries, and periodontal disease can be prevented. The results of a clinical survey and a laboratory investigation (into the packing of Class II cavities) suggested that for a matrix-band technique to be effective in restoring interstitial contour and preventing cervical overhang of amalgam, the bands must always be contoured and wedged.

Acknowledgements.—The author wishes to thank Messrs. B. M. Wilkinson and K. Marshall for their assistance in preparing the models, and the Photographic Department of the Sheffield United Hospitals for preparing the illustrations.

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Medical Emergencies for Dentists

Patients die in dental surgeries every year. Some of these fatalities are the direct result of dental procedures, while others occur coincidental to the patients being in a dental surgery when stricken.

The emergencies and complications that can lead to serious disability and even to death are the direct concern of every practising dentist. The dentist must have a knowledge of pharmacology, physical diagnosis, anatomy, physiology, and pathology.

The emergencies that should be dealt with in the surgery are as follows:—Drug allergy; local anaesthetic reactions; cardiovascular emergencies, e.g. angina pectoris, coronary thrombosis, and cardiac arrest; syncope; shock; respiratory emergencies. The treatment of these conditions is also described.—KOGAN, S. (1958), *Oral Surg.*, **9**, 246.

THE PREPARATION OF THIN PLANO-PARALLEL SURFACED SECTIONS OF UNDECALCIFIED TEETH

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INTRODUCTION

FOR many years attempts have been made to produce sections of undecalcified teeth comparable in quality and thickness to decalcified microtome sections.

Owing to the great density of the material and the modern techniques which can now be employed for its examination, sections of undecalcified material should be ideally even thinner than normal paraffin-embedded sections (7 μ).

For the preliminary sectioning of a tooth, Lefkowitz (1941) used a phosphor-bronze disk 150 μ thick charged with diamond particles, while Atkinson (1950, 1952) utilized a 125 μ carborundum disk.

The subsequent reduction of these thick sections was attained by a variety of methods, including hand grinding on a carborundum stone, or with an abrasive paste on glass or a soft lap. Various mechanical aids have been used with these techniques. To give support to the section, and for ease of handling, they were often embedded in resin.

However, most methods described produce sections 20 μ thick (Lefkowitz, 1941), involve a technique of producing a wedged section tapering to a very thin margin (Gustafson, 1945), or only produce very small areas of thin sections (Jansen, 1950).

The greatest difficulty was the plano-parallel grinding of the surfaces, one edge invariably being reduced at a greater rate than the other.

The method to be described is convenient, easy, reasonably quick, and requires no additional expensive equipment to the sectioning machine.

METHOD

The sections were cut with a carborundum disk on a machine as described by Atkinson

(1950). The specimen was slowly advanced on to the edge of the carborundum wheel measuring approximately 125 μ in thickness and 3 in. in diameter, revolving at 10,000 rev. per min. Water was used as a lubricant.

In addition, however, it was found necessary to take the following precautions:—

1. The edge of the wheel was trimmed with a diamond to ensure its running truly, and to

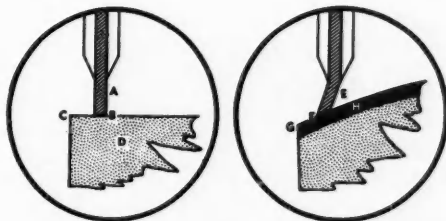


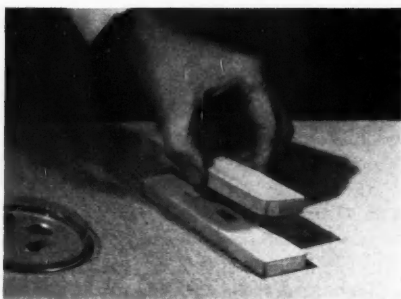
Fig. 1.—Factors influencing section cutting. Favourable: A, A true running wheel; B, A square edge to the wheel; C, A flat specimen surface at right angles to the plane of the wheel; D, Dentine. Unfavourable: E, An irregular wheel; F, An oblique edge to the wheel; G, A curved specimen surface not at right angles to the plane of the wheel; H, Enamel.

enable a square edge to be presented to the specimen. This latter step was necessary to reduce the possibility of an oblique cutting edge glancing off the surface of the specimen (Fig. 1).

2. The surface of the specimen presented to the wheel was prepared flat and smooth, and if possible consisted of dentine rather than enamel, and was presented at right angles to the plane of the wheel. Again this was in order to reduce the possibility of the wheel glancing off the surface of the specimen (Fig. 1).

3. The specimen was advanced towards the wheel only a fraction of a millimetre at a time, contact being noted by the slight sound it made. The first millimetre of the cut was then made at the same speed, after which the

specimen could with safety be advanced more quickly. The last millimetre of the cut was also made very slowly to avoid the specimen being thrown violently off the wheel.



frequent lavage (Fig. 2). The sections were manipulated with a camel-hair brush.

With reasonable care complete sections of teeth were produced, 10 μ thick—when

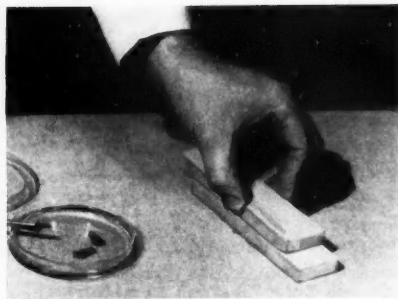


Fig. 2.—Milling the section between the two matched stones.

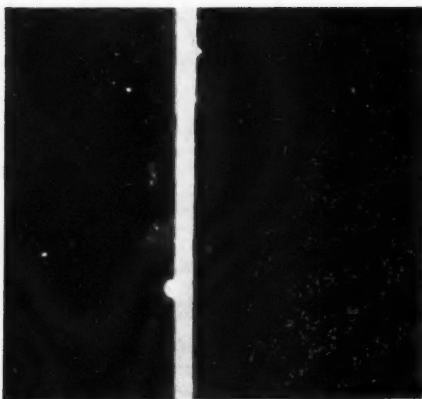


Fig. 3.—A microphotograph of a dentine section embedded in resin, as seen by reflected light. The surfaces are seen to be plano-parallel, and the thickness of the section can easily be measured with a micrometer eyepiece.

4. If an unsatisfactory initial cut occurred a new one was commenced at a different location, thus removing a thick section, after which a new thin section could be commenced.

Using such a machine and technique, sections 50–100 μ thick were readily produced. These sections were now “milled” between two superfine stones—Carborundum No. 201 A, which had been previously milled together; water being used as a lubricant and for

milling was continued the enamel was lost. Complete sections of dentine only, 5 μ thick, were readily obtained.

Such grinding of the sections, however, resulted in the total loss of pulpal tissue, predentine, and a variable amount of intermediate dentine. This loss was prevented by embedding the tooth in methyl methacrylate resin prior to sectioning and subsequent grinding (Atkinson, 1952).

MEASUREMENT

The thickness of these sections was measured with the microscope, focusing first on the upper and then the lower surfaces. Although this is a convenient method it is unreliable, and was therefore checked in the following manner:—

Two small disks, 1 cm. in diameter and 3 mm. thick, were cut from an acrylic rod, the surfaces ground flat, dried, and placed with the section in absolute alcohol for 5 min. The alcohol was then replaced with methyl methacrylate monomer for a few moments. One disk was now placed on a glass slide with the section on top of it, a drop of acrylic syrup (Atkinson, 1952) placed on it, and then the second disk seated in place over it. The acrylic was now polymerized at 50° C., a disk of acrylic being obtained 1 cm. in diameter and 6 mm. thick, containing a flat section in the centre. Half the disk was now ground at right angles to the

flat surfaces so that the section was exposed and cut transversely, enabling it to be examined and measured under the microscope by reflected light.

By this method it was possible to measure the thickness of the section accurately, and observe that the surfaces were plano-parallel throughout (Fig. 3).

The measurements were carried out using a Watson screw micrometer eyepiece, and an oil-immersion objective, so that one μ equalled 5 divisions on the eyepiece screw. The margin of error was thus reduced to a minimum.

Acknowledgements.—The author wishes to express his gratitude to Professor H. G. Radden for his guidance and helpful criticism, and also to the Department of Medical Illustration, Manchester Royal Infirmary, for producing the photographs.

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BOOK REVIEWS

CLEFT PALATE AND SPEECH. By MURIEL E. MORLEY, M.Sc., F.C.S.T., Speech Therapist-in-charge of the Speech Therapy Unit, the United Newcastle upon Tyne Teaching Hospitals. Fourth edition. $7\frac{1}{4} \times 4\frac{3}{4}$ in. Pp. 271 + xx, with 86 illustrations. 1958. Edinburgh and London: E. & S. Livingstone Ltd. 27s. 6d.

The publication of a fourth edition of Miss Morley's excellent book on cleft palate and speech will be welcomed by the dental profession and in particular by those interested in this subject and already using the earlier editions as a standard book of reference.

The book has been re-written in many parts but the same easy style of prose and the high standard of illustrations remain, particularly with the coloured drawings showing surgical procedures for cleft-palate operations.

The chapter on problems associated with cleft palate includes a discussion on the growth of the jaws and the orthodontic problems involved. It seems a great pity that emphasis should have been put on McNeill's work whilst Harvold, the pioneer on orthodontic treatment for this condition, is not even mentioned. The value of team work already established in other countries is rightly stressed and will be wholeheartedly supported by workers in this field.

This book is written primarily for the speech therapist, but will continue to find an essential

place in dental literature. It is highly recommended to those not already familiar with the earlier editions and also to dental students who require a balanced picture of the cleft-palate problem.

M. A.

FULL DENTURES. By GEORGE ALEXANDER LAMMIE, Ph.D., B.Sc., H.D.D., Formerly Visiting Associate Professor, Northwestern University, Chicago; etc. $8\frac{5}{8} \times 5\frac{5}{8}$ in. Pp. 212 + x, with 66 illustrations. 1956. Oxford: Blackwell Scientific Publications. 30s.

THE provision of full dentures is still an important part of the work of the dentist, and the successes of preventive dentistry in lengthening the life of the teeth and of preventive medicine in lengthening the life of the individual have in recent time altered the circumstances in which full dentures are required—the age of the nearly edentulous patient is higher and the period of edentulousness is longer. The task of the prosthetist thus tends to become more difficult and more responsible, for he has to deal with patients of lowered adaptive capacity and with tissues increasingly susceptible to injury.

Little has been done by way of research to give the prosthetist new techniques to cope with his difficulties. This is not the crying misfortune it might seem, for the dentist as prosthetist has shared with benefit what dentistry as a whole has gained from the slow

reorientation towards biology that has taken place in recent years. Dentistry's newly won political anatomy has fortunately not extended to its clinical thinking, and to an ever increasing extent dental views on dental problems are influenced by ideas derived from general anatomy, physiology, and pathology.

Dr. Lammie's book is to be welcomed as forwarding that tendency. It is avowedly aimed at the undergraduate, but at the undergraduate as a thinking animal. No violent prejudices are aired or ill-based speculation inflated. Instead, the author presents a dispassionate account of possible basic techniques and sets them in a framework of what is known of the structure and function of the tissues of the edentulous mouth. His statements of opinion are expressed in an admirably restrained manner, and the reader

is implicitly invited to consider the subject for himself.

It is the reference to the biology of the environment of the dentures that makes the book valuable, for it permits Dr. Lammie to show how discrimination in the application of the techniques does in fact enlarge the dentist's capacity to meet the more exacting needs of the older patients, the age group that is becoming more numerous and more demanding.

Apart from small criticisms of detail—for instance "contra-indicated" is such a clumsy equivalent for "undesirable" or "unsuitable"—and differences of opinion, it is reasonable to hope that later editions will emphasize still more the illumination of diagnosis and prognosis that can be derived from ideas of greater generality than is implied in the term "false teeth".

F. F.

ABSTRACTS FROM OTHER JOURNALS

Critical Analysis of Pain Incidence during 1508 Operative Procedures with Rotating Instruments

In this study all but 57 cavities were cut under continuous air-water spray without the use of local anaesthesia. The patients' opinions were classified into one of three groups: (1) No pain; (2) Moderate pain, i.e., occasional twinge; (3) Considerable pain for each cavity prepared.

In 463 patients with an age range of 3-77 years, 1451 cavities were prepared. No cavities were cut without the air-water spray. Diamond stones and carbide burs at 10,000-13,000 r.p.m. were used for all cavities except Class III, when steel burs at 2000-4000 r.p.m. were used.

Of the 1248 permanent teeth cut 28 per cent experienced no pain and 60 per cent moderate pain, making a total of 88 per cent in which cavity preparation was tolerable. For deciduous teeth the figures were 52 per cent no pain, and 41 per cent moderate pain, totalling 93 per cent tolerable.

Certain factors analysed showed no statistical significance for pain experience. These were sex, time of day, tooth involved, and upper or

lower arch. Class II and V cavities gave more pain than Class I and III cavities in permanent teeth. Increase in age showed a decrease in "no pain" and an increase in "moderate pain".—HERZBERG, F. (1957), *J. Amer. dent. Ass.*, 55, 515.

Hygroscopic Expansion of Dental Investments

The discovery of hygroscopic expansion by Scheu and the development from this of a precision casting technique by Hollenback are described. Many factors are known to affect the magnitude of this expansion, including powder/water ratio and time in water-bath. Factors investigated in this study were composition of the investment, effect of drying, and effect of temperature.

The magnitude of the hygroscopic expansion was first determined using the conventional trough and comparator microscope. Friction between the investment and the trough prevented maximum expansion being achieved and no absolute value was obtainable. However, by using wet asbestos as a liner between investment and trough the expansion was improved, thus confirming the value of

such a technique in routine casting. This method was thought suitable for a comparative study.

(1) Any gypsum investment consists principally of silica and hydrocal. The amount of expansion decreased with the increase in hydrocal. (2) The expansion was less if the investment was allowed to set in dry air conditions than if allowed to set under water at 37° C. (3) One investment used showed a decrease in expansion when the water-bath was used at a lower temperature of 25° C.—

SKINNER, E. W., and DEGNI, FRANCISCO (1957), *J. Amer. dent. Ass.*, **54**, 603.

Hypnosis in Dentistry

Hypnosis in dentistry is not new. It has appeared from time to time, but whether owing to improper training of operators, to the realization of possible dangers involved in its use, or to other causes, it has not become a generally acceptable technique.

An effort is being made to obtain all information possible regarding its effect on patients and its possible dangers before its general use is advocated. To this end the answers are given to the following questions:—

1. Does a patient surrender his will power under a hypnotic trance?

2. After a patient has been hypnotized for the first time can he be put into a trance more readily?

3. Can the operator use a particular expression, a specific gesture, or even a single word which would hypnotize the patient at subsequent sittings?

4. Under favourable conditions can the use of this gesture or key-word by another person cause the subject to fall into a trance?

5. In how short a time can some previously hypnotized subject be put into a trance?

6. Is a statement given to a subject under trance unhesitatingly accepted as being true?

7. Does a subject carry out a command given under hypnosis after he has been awakened?

8. Is a post-hypnotic suggestion carried out by a subject, if it fits into his or her ethical code?

9. Is an immoral post-hypnotic suggestion carried out by the patient? If not, why not?

10. Is it certain that no mental complexes are developed in a patient while he is in trance as a result of a random statement such as he does not feel he cannot hear.

11. Under what conditions is it inadvisable to use hypnosis?

12. Is the precise effect of hypnosis on the psyche of a subject known?

13. Are there not four separate and divergent theories regarding the manner in which hypnosis is achieved?

14. What subjects would be considered necessary in a thorough course in hypnosis, and what should be the duration of the course to prepare the operator to use hypnosis safely?

15. Is hypnosis used commonly in medicine for the elimination of pain resulting from surgery or is it applied solely for psychiatric treatment?

16. Is a hypnotic technique taught in medical or dental schools for the purpose of analgesia?

17. Would you permit members of your family to be hypnotized by an acquaintance who did not have an accepted training in psychology and psychiatry?

18. What percentage of cases in dental practice would be treated more suitably with hypnosis rather than by the accepted anaesthesia technique?—BODEAKER, C. F., BORLAND L. R., MILLER, J. S. A., and SCHEMAN, P. (1958), *N.Y. St. dent. J.*, **24**, 165.

Some Observations on Costen's Mandibular Syndrome

These symptoms have been studied in a hundred cases and the following observations made:—

Sex incidence.—4 females to one male.

Age incidence.—Between 20 and 50 years.

Symptoms—local and regional.—(1) Neuralgia of second or third divisions of the fifth nerve; (2) Pain in and around ears; (3) Headache, top of head; (4) Pain up back of head or down side of neck; (5) Painful spasm of muscles, masseter and temporalis; (6) Pain in throat or on swallowing; (7) Tinnitus; (8) Stuffiness in ears; (9) Impaired

hearing; (10) Sinus pains; (11) Altered taste or sensation of tongue.

Treatment.—One of the following treatments was prescribed: (1) Some form of removable prosthetic appliance; (2) Fixed onlays; (3) Fixed bridges; (4) Selective grinding, muscle exercises and self-control; (5) Injections into the periarticular tissues and joint cavities of hydrocortisone; (6) Unilateral meniscectomy.

The following percentage of the results of treatment is given: 34 improved, 60 cured, 6 unchanged.—HANKEY, G. T. (1958), *Proc. R. Soc. Med.*, 51, No. 4, 225.

A Study of Partial Denture Design and Masticatory Pressures in a Mandibular Bilateral Extension Case

A scientific method of measuring the effect of variations in the design and in the masticatory areas in bilateral free-end saddle types of partial lower dentures with regard to their efficiency and their influence on dietary and masticatory habits is described.

A method of substitution and interchange of the occlusal areas on the same denture base reduces possible error to a minimum.

Relative stability of the various designs for the same masticatory areas is noted, and a table comparing the results of the tests for a large and a small masticatory area for each denture design shows the relative efficiency.—KAİRES, A. K. (1957), *J. prosth. Dent.*, 8, 340.

Mixed Tumour of the Tongue

Mixed tumours may be found in almost all of the associated structures of the mouth. The tongue, however, is a rare location for a mixed tumour.

An interesting case is reported in which the tumour shelved out, indicating that it was of a benign variety. However, invasion and penetration of the capsule could have occurred. For this reason the possibility of future local recurrence exists.

A marked tendency to recur after operation is one of the most objectionable features of the mixed tumour. The lesion may be erroneously diagnosed pre-operatively as a mucous cyst.

Cystic appearing abnormalities of the tongue are not to be viewed lightly.—WIGAND, F. T. (1958), *Oral Surg.*, 9, 118.

LETTER TO THE EDITOR

September 10, 1958

Dear Sir,

I was interested to read in Mr. Dickson's letter his query regarding the use of zinc oxysulphate cement, of which I had often heard but had never used. The purpose of my article was to discuss those lining materials with which I was conversant, so consequently this cement was not mentioned.

I had some difficulty finding any reference to zinc oxysulphate cement in contemporary text-books, but in *The Science and Practice of Dental Surgery* (1914), edited by Sir Norman Bennett, I noted the following: "It forms a white plastic mass which sets somewhat quickly but does not become very hard and may be easily cut with an excavator. It is too soft and too readily acted upon by moisture to be employed even as a temporary filling."

"Fletcher's artificial dentine is a cement of the same class; it produces a harder mass than the above, and may be used to seal temporary dressings or as temporary fillings for a few weeks in sensitive cavities." I trust this will answer his query.

With regard to the use of "Dropsin" I must admit that I have no first-hand experience of the cement nor have I been able to find out its composition. Its chief advantage appears to lie in its use as a lining for acrylic fillings in shallow cavities, but I know of no objection to its use for other purposes.

Yours faithfully,

J. J. MESSING

Dental Unit,

University College Hospital Medical School,
London, W.C.1.

SOME SURGICAL PROCEDURES RELATED TO ORTHODONTIC TREATMENT

By J. H. HOVELL, M.R.C.S., F.D.S., D.Orth. R.C.S.

IN dealing with surgery in relation to orthodontic treatment, there are two main categories to be considered. First, there is surgery which is needed to allow the correction of local abnormalities of position. Secondly, there is surgery for the correction of extreme variations of the skeletal pattern. These extreme variations produce malocclusions which are not treatable by normal orthodontic methods, for example, the gross Angle's Class III case.

There is one principle which is common to both categories—this is that full diagnosis and treatment planning, to include any preliminary orthodontic work, must precede surgery. However technically perfect the surgery, it is likely to fail if diagnosis and treatment planning have been faulty. Providing the ultimate aim is achieved, the actual technique by which it is reached is quite unimportant. It is really immaterial providing first principles of surgery are observed, whether, for example, bone is removed by burs, hand gouges, or chisels. The most important first principles are asepsis, adequate access, and firm but gentle handling of tissues with no avoidable trauma. Asepsis is, of course, unobtainable in the mouth, but this does not mean that it should be ignored. Cold surgery in the mouth should never be undertaken in the presence of acute gingival inflammation or in a post coryzal period when a mixed infection of the nasopharyngeal mucosa is likely to be present. In addition, full aseptic precautions should be taken to prevent contamination by pathogenic bacteria not already present in the mouth.

With regard to the routine administration of antibiotics in cold surgery in which infection is likely to supervene, there have always been two schools of thought. Apart from a short period in the early days of antibiotics I have always considered this to be of no value whatsoever. Surgical opinion is now swinging

even further in this direction in considering that it may even be harmful. Antibiotic resistant strains of organisms may arise or be permitted freer development by the absence of other inhibiting organisms. A post-operative infection with these organisms is often most difficult to control and an extremely serious complication. Local application of penicillin powder or cones in the absence of parenteral administration is not merely useless but may be even more actively harmful. Individual sensitization to penicillin is more likely to arise from these small doses, and in my opinion the local use of penicillin cones, powder, and lozenges without concurrent maintenance of an adequate blood-level is an indefensible procedure. Penicillin is far too valuable a live-saving drug to be frittered away, and for a patient to become allergic to it and be denied its use in, shall we say, pneumonia or endocarditis, is an absolute tragedy.

Fortunately, in the first category of cases the surgery is of a minor nature and children's mouths are, or can readily be made, very clean. In addition, wounds in or around the mouth and face, with few exceptions, heal readily with a minimum of secondary infection. In the second category, even if the surgery is not carried out completely extra-orally, infection seldom supervenes if pre-operative elimination of oral sepsis and the employment of a full aseptic technique are carried out.

The conditions in my first category with which I will deal are as follows:—

1. Frænectomy;
2. Removal of supernumeraries;
3. Removal of buried teeth;
4. Uncovering unerupted teeth.

It will be noted that in this list I have not included the removal of lower third molar germs or unerupted more fully developed third molars. The removal of third molar germs before calcification commences is a very

Given at the meeting held on March 10, 1958.

simple procedure, easily carried out under local anæsthesia. C. Bowdler Henry introduced this operation and I first performed it as his house surgeon in 1934, since when I have done many cases—very, very few recently, however. I think that if we can develop adequate criteria for assessing between the ages of 7–12 years the likelihood of future third molar impaction, this operation may well be a clinically desirable undertaking. It should be noted that this operation is only simple up to the time the calcifying cusps commence to unite. After this it becomes much more difficult and should not be done under local anæsthesia. The reason for its omission is that I consider that from the point of view of orthodontic treatment removal of third molars is valueless. Arising on the surface, the third molar germ sinks into the body of the bone and does not appear in the dento-alveolar part of the jaw which concerns orthodontists until well after the normal age for orthodontic treatment is past.

There are two possible ill-effects upon the occlusion which may be produced by the third molar teeth: one is relapse of previously undertaken orthodontic treatment and the other is forward drift of buccal segments with late imbrication in the labial segments.

The effect is often, I think, due to incorrect initial diagnosis, and treatment without extraction in cases in which extraction was necessary in order to obtain a stable result. The imbrication of lower incisors, subsequent to intermaxillary traction, was also often wrongly attributed in the past to pressure from third molars.

Late imbrication of labial segments is undoubtedly due in many cases to a maturation change in soft tissue relative to skeletal morphology, producing an uprighting of the incisor teeth.

As far as I am aware there has not yet been produced a statistically valid assessment of lateral radiographs to show whether or not erupting third molars can produce a forward drift of buccal segments.

It is my opinion, from clinical observation, that this does occur, especially in the upper arch. Clinical observation, however, must be

substantiated by scientific proof to be of real value, and I am therefore perfectly prepared to eat my words if necessary. I should very much like to hear observations from other members on this point.

In the immediate post-war period I passed through a phase during which in my clinical assessment of cases I decided that extraction of lower third molars whose crowns were fully formed was a correct adjunct to orthodontic treatment. This was usually about the age of 14 or 15. These teeth were always deeply buried in the body of the mandible. Other members of the orthodontic staff or consultants frequently asked me to do these teeth for them.

Some weeks or months later a case would appear in the theatre for removal of third molars. After an hour's exhausting work, having inquired "What moron suggested subjecting a child to all this?" and being told it was myself, I quickly revised my views as to the desirability of carrying out this particular operation. Taking as a criterion whether or not I would advise my own child to have this non-essential operation, the answer is "not under any circumstances". Removal of third molars at this stage of development is far more difficult and traumatic than either earlier or later, even should they become impacted. Post-operative pain or swelling is frequently severe. For these reasons, added to its doubtful orthodontic value, this is a completely unjustifiable procedure.

It may appear to many of you that I have not so far given the sort of paper which its title leads you to expect. However, it is my firm conviction that the actual techniques of dentistry should be by far the least important part of our professional skill. In fact, many of the more mechanical procedures should rightly be deputed to ancillaries. While I am not suggesting that surgery should be carried out by theatre orderlies, it is nevertheless only a technique—a mixture of carpentry and needlework carried out in a confined space, often with poor visibility on a living subject. I wish to stress, therefore, the primary importance of diagnosis whenever the use of surgery is considered.

FRÆNECTOMY

The controversy still rages as to whether the persistent frænum is in fact the cause of separation of upper central incisors. Regretfully I must decline this challenge and confine myself to a statement of fact. That is, that in properly selected cases in which the operation is properly performed, natural closure of the median diastema will often occur. The main indication is that spacing should be present in spite of the presence of factors which should tend to close it. When erupting laterals have failed to close a normal median diastema, but have instead become, through lack of space, rotated and misplaced themselves, a frænectomy is definitely indicated. I have never myself seen a median diastema without the frænum passing between the incisors to be attached palatally, nor do I consider that the actual form and consistency of the frænum is of great importance.

In cases in which a median diastema is present due to missing or small laterals, or generally small teeth in a large arch, the prognosis for natural closure is not so good. When, however, spacing is entirely midline, all other teeth being in contact, the diastema may close partially with a distribution of the spacing between other teeth and a great improvement in the appearance.

Providing the operation is not carried out as a "smash and grab" procedure under nitrous oxide anaesthesia, actual technique is unimportant with one exception. This is, that the excision should not be confined only to the soft tissues. It is absolutely essential that in addition fibrous tissue and bone in the midline between the teeth should be removed almost to their apices, and as widely as possible without exposing tooth root. I do this with a fissure bur under water-jet. I have now operated upon quite a number of cases in which removal of soft tissue alone has produced no improvement, but subsequent more complete midline excision has resulted in natural space closure.

Although the lip mucosa is carefully closed I do not consider that it is necessary to swing mucosal flaps to cover exposed bony areas. When the frænum is abnormally wide it may

be difficult to approximate the mucosal edges. To facilitate this, vertical incisions are made about $\frac{1}{8}$ in. laterally on each side of the midline to allow mesial sliding of the mucosa.

REMOVAL OF SUPERNUMERARIES

A complete orthodontic diagnosis must first be made, so that any extractions required as part of the treatment plan can be done at the same time. The age-group for this operation is usually from 8 to 12 years, and in all but the easiest cases general anaesthesia is preferable. It is, therefore, doubly annoying if a general surgeon removes the supernumeraries and the orthodontist finds a few weeks later that extraction of premolars possibly unerupted is at once necessary.

This is even more important when the supernumeraries have obstructed and prevented eruption of one or more incisor teeth, usually centrals. Frequently in such cases there has been forward drift of buccal segments with loss of space in the labial segments.

For such buried teeth to erupt with certainty certain principles must be strictly adhered to:—

1. Their crowns must be uncovered.
2. If at all deeply buried, a pack must be stitched in at the time of operation and a bung added to a previously constructed plate to keep the opening patent while the teeth are erupting.
3. There must be room in the arches for the teeth.

Non-observance of any of these principles may lead to non-eruption of the incisors. Their crowns then become bound up in a mass of fibrous scar-tissue, which not only effectively prevents any further eruption, but also makes much more difficult their subsequent exposure and bringing into position by means of pinning or banding, which now become unavoidable.

It is essential that a plate be made pre-operatively. It is desirable that space in the arch should be created pre-operatively. This may involve extractions, however, and therefore for this reason, and also because the sooner after the age of 7-8 years that supernumeraries are removed the better, space

creation can be done in conjunction with the other post-operative treatment.

Localization of the supernumeraries is obviously of importance. Personally I find three intra-oral films, with different angles of incidence of the beam, quite adequate. More views are preferred by some operators, but it should be borne in mind in this connexion that radiation, especially in children, should be kept to a reasonable minimum.

The operative approach in the majority of cases is from the palatal aspect. The incision is along the gingival trough extending between the mesiopalatal aspects of the two first permanent molars. This permits backward reflection of the entire anterior portion of the hard palate.

There is absolutely no justification for making this incision 2 or 3 mm. distant from the cervical margins of the teeth. Not only does this leave a scruffy, narrow fringe of mucosa, which may slough away in parts, but it impedes vision just where this is most important—close to the roots of the incisor teeth, damage to which must be carefully avoided during the operation.

No special difficulty arises with the completely palatally placed supernumerary, nor with the more superficial, preventing eruption of more deeply placed teeth. The really tricky tooth is the inverted long, thin one lying buried directly between the roots of the central incisors. It may be found extremely tricky to "winkle out" such a tooth without damaging those adjacent to it. A dodge I often use is to make a second approach from the labial sulcus; the crown being exposed from this aspect it is quite simple to push the tooth through to the palatal side, rather in the same way that a nail is knocked out of a piece of wood.

One midline mattress suture is used to secure the flap. The only occasion upon which a hæmatoma formed below the flap and raised it was when several sutures were used. Healing is rapid, and strangely enough there is little or no post-operative discomfort.

REMOVAL OF BURIED TEETH

In my opinion buried teeth which are giving no trouble are best left buried. They may

erupt and then are much more easily removed, or on the other hand remain trouble free until pressure from a denture stirs them up. If, however, the tooth is in communication with the surface, i.e., has a sinus leading down to it, it should always be extracted. It may also be preventing correct alinement of erupted teeth, and for this reason have to be removed.

Resorption of adjacent teeth by a completely buried tooth, e.g., an upper canine, in my experience always occurs during the eruptive phase of the tooth, and is an aberration of the normal resorption of the deciduous teeth during the eruption of their successors. This resorption commences very early, and I have seen a lateral incisor root completely resorbed by the age of 11 years. On the other hand, I have never seen a case in which resorption in connexion with such a tooth has commenced after it has become fully impacted, other than in connexion with an intra-oral sinus and infection.

If a canine causing resorption is exposed and brought down into position, the resorption ceases and there is no apparent damage to the resorbed tooth other than loss of part of its root. I find this rather surprising, but it has proved to be the rule in every case in which orthodontic considerations ruled out extraction of either the resorbed tooth or the canine, and the latter was therefore brought into position.

One valuable point to remember is that when the crown of a buried tooth is on the labial or buccal aspect of the arch, the root is on the lingual or palatal, and vice versa. This enables the same dodge to be used to prevent damage to adjacent teeth as with the inverted midline supernumerary. It is particularly valuable with the upper canine which has become palatally impacted. The apex of this tooth is invariably situated fairly superficially on the buccal aspect somewhat higher and more distal to its normal position. Adequate bone removal palatally is difficult without damage to adjacent teeth and it therefore becomes necessary to split off the crown as a first step in its removal. Using Warwick James or similar elevators it may then be possible gently to "winkle out" the root.

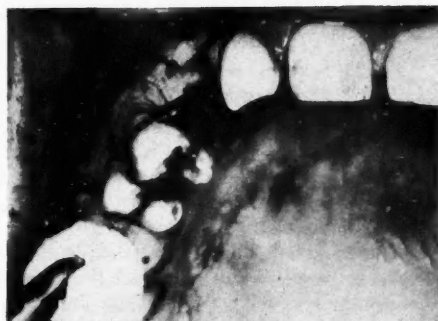
Occasionally, even when there is no apical dilaceration, this attempt may fail, and only too often I have seen cases in which irreparable damage has been done to lateral incisor or first premolar. This is quite unnecessary. An



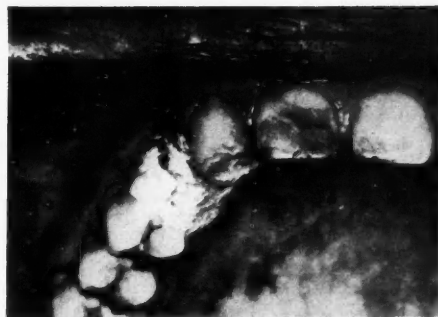
A



B



C



D

Fig. 1.—Exposure of palatal canine. A, Radiograph; B, Removal of area of palatal mucosa; C, Insertion of pack (N.B.—A mattress suture is first inserted and looped out of the way around the adjacent teeth); D, Pack in position.

incision is made fairly high in the buccal sulcus and the apex exposed, working carefully from before backwards above the level of the first premolar apex. The apex is then split off or removed with a bur as in an apicectomy, and the middle third of the tooth pushed out through the palate. The antral lining may be exposed in this way, but this does not matter as long as the apex is not pushed into the antrum.

UNCOVERING UNERUPTED TEETH

The tooth most commonly requiring this procedure is the palatally misplaced canine. In my personal experience success even in apparently very difficult cases is invariable, and resort to pinning, banding, or putting wires round the teeth or acrylic caps on them, is never necessary. In this connexion it is only fair to add that the less the displacement the

more likely is it to be orthodontically desirable to bring the tooth into the arch. The very high almost horizontal tooth is usually better left where it is. The best time to deal with these teeth is at the age when they would normally be erupting, and certain basic principles must be adhered to if they are to be easily brought into position. These principles are as follows:—

1. There must be space in the arch for the tooth. This must either be created by

orthodontic treatment or by extraction, usually of the first premolar at the time of operation. To expose the tooth "to see whether it will erupt" before deciding upon extraction is the

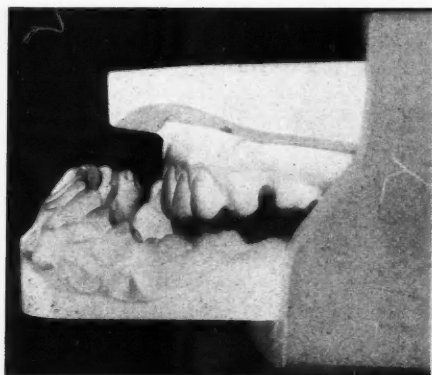
2. The exposure must be adequate. A piece of mucosa, midway in size between a shilling and a sixpence, should be removed. The palatal aspect of the crown must then be uncovered



A



B



C

Fig. 2.—Pre-operative appearance of a severe case of mandibular prognathism. A, Photograph; B, Lateral radiograph; C, Models.

height of futility. The usual fate of such teeth is that they fail to erupt, become infected, and are subsequently removed. In this connexion it should be noted that not only does removal of the first premolar as it were clear the way for the necessary change in axial inclination of the canine, but it also facilitates adequate surgical exposure.

up to at least the extent of the clinical crown, special care being taken completely to free the tip. Rose-head burs are used to remove bone without damage to adjacent teeth, and it is taken away as freely as possible in the direction, i.e., distolabial, in which it is desired that the crown shall move. If the deciduous canine and/or first premolar are extracted, their sockets should be made completely continuous with the crypt around the canine crown, by removal of all bone in between and some septal and interradicular bone, avoiding, however, any encroachment on the labial plate.

3. The exposure must be maintained continuously during the post-operative and eruptive period.

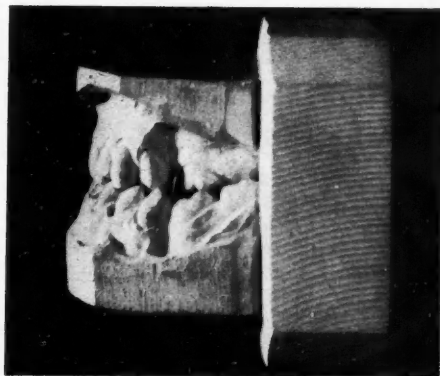
This is done by a pack, stitched in at operation, and a bung added to a prefabricated plate when the pack is removed 7-10 days later. There must be a minimal interval between removal of the pack and insertion of the bung.

For this reason the plate should be made and worn some weeks before operation, and an impression taken of the cavity on the plate and immediately processed in cold cure acrylic,

is almost invariably much higher and more horizontal. Secondly, adequate exposure without damage to the lateral incisor is difficult, if not impossible. Thirdly, and to my mind most



A



B



C

Fig. 3.—Post-operative results. A, Photograph; B, Model; C, Lateral radiograph.

so that the bung can be inserted within the hour.

4. The bung must be frequently and correctly trimmed in the direction in which the tooth is desired to erupt, but in such a way that the tissues are not allowed to close over the tooth. This is, in fact, a sort of hollowing-out process to accommodate the crown as it surfaces. Trimming should be at least once a fortnight, as otherwise scar-tissue has a chance to form around the tooth and prevent its eruption.

I have seen many cases in which exposed palatal canines have failed to erupt without being pulled. This failure has always been traceable to non-observance of one of these four basic principles. There is a lot to be said for an orthodontist also being an oral surgeon!

The buccally impacted canine (Fig. 1) is quite different for several reasons. First, it

important, the crown is above the reflection of the mucous membrane. It is, therefore, quite impossible to keep the exposure patent with a bung, as the tooth becomes so firmly fixed in position by dense scar-tissue that it is often impossible to bring it into the arch with traction.

[At this point short films of a frænectomy and removal of a supernumerary were shown.]

The second category of case, i.e., correction of extreme variations of the skeletal pattern, merits a full-length paper on its own. I will, however, show you what can be done by the following slides of a case of mandibular prognathism I recently treated.

The prognathism was so severe that the lower third molars just occluded with the incisors during lateral excursions. An angle resection was carried out, as it was necessary to reduce the length of both body and ramus, a little over an inch of bone being removed. The approach was entirely extra-oral and iliac crest bone-chips were used to hasten union. A corresponding wedge of skin subcutaneous tissue and platysma were excised to eliminate the double chin which would otherwise have

resulted. The post-operative course was uncomplicated and complete union achieved in good position.

Figs. 2 and 3 show the radiographs, photographs, and models of this case.

I must ask you to forgive me for much that has been left unsaid, or perhaps over-compressed. I shall, however, do my best to reply to any questions you may put, with the President's permission, replying to each at the time, rather than all at once at the end.

Acknowledgements.—I would like to acknowledge the help I have received from the Photographic Departments of the Royal Dental Hospital and St. Thomas's Hospital, and my debt to my early teachers at the Royal Dental Hospital, especially C. Bowdler Henry and S. A. Riddett.

DISCUSSION

Mr. G. L. Fordyce, in opening the discussion, said that Mr. Hovell had a manner of presentation, a freedom of expression, and a quality of thought which were all his own.

He wished to congratulate Mr. Hovell on an excellent and clear exposition of his subject. Only once did Mr. Hovell allow his schizophrenic professional existence to overtake him and elevate himself from his surgical to full orthodontic status when he made the statement "Late imbrication of labial segments is undoubtedly due, in many cases, to a maturation change in soft tissue, relative to skeletal morphology", etc. He understood that what Mr. Hovell felt was that irregularity of incisor teeth might be caused by an alteration in lip musculature relative to the teeth and jaws or, it being very colloquially translated, crowded teeth might be caused by changes in the lips as one grew older. If he might roughly translate H.R.H. The Duke of Edinburgh, "Let them keep science simple".

Mr. Hovell had invited discussion on the influence the third molar teeth might or might not have on the forward drift of buccal segments and imbrication of labial segments, and had suggested that third molars could produce a forward drift of buccal segments. It was, however, true that buccal segments would drift forward whether third molars were present or not. Mr. Hovell had said that in many cases the irregularity was due to changes in the lip behaviour. If the first premolar teeth were absent the imbrication would not occur. There must, therefore, be a constant forward pressure which disallowed the dissipation of the increased lip pressure throughout the buccal segments.

He wished to bring to the notice of the meeting a point made by Mr. Hovell, with which he concurred, on the subject of supernumerary teeth. Mr. Hovell had said: "The sooner supernumerary teeth are removed the better". That was not, as one might think, in agreement

with general teaching as expressed in standard text-books. The view expressed there was that supernumeraries should not be removed until such time as the permanent teeth had fully formed. Perhaps other views might be expressed on that subject.

He noted that Mr. Hovell had made no mention of the operation known as transplantation of teeth. Perhaps Mr. Hovell felt that such-like party tricks should be reserved for the very, very rare case. That subject also might be discussed.

Mr. Fordyce then showed four slides.

The frænectomy technique which he employed differed from that of Mr. Hovell and his slides might be of interest to the meeting. He agreed fully with Mr. Hovell that the detail was not of importance in treating the soft tissue. The essential feature was the division between the roots of the teeth, as described most adequately by Mr. Hovell.

On the subject of osteotomy, the surgical correction of mandibular deformities, and, for that matter, maxillary deformities, raised points of great orthodontic interest. Mr. Hovell had mentioned some of these.

In his experience the assessment of prognathism by the use of radiographic surveys had been disappointing. The measurements of S.N.A. and S.N.B. angles, one would imagine, would be of assistance in assessing prognathism, and would be expected to indicate the case in which the upper jaw was under-developed rather than the lower jaw being over-developed. He had not found those angles reliable.

The follow-up examination of osteotomy cases brought a point worthy of mention to an orthodontist. It was found that in cases where severe mandibular prognathism had been corrected expansion of the lower arch occurred and that the lower incisor teeth became erect. That expansion could be in the region of 5, 6, or even 7 mm. The point of interest was that no such expansion occurred

in the maxillary arch. That enhanced the view which some held that the tongue exerted little influence on the shape of the maxillary arch.

Mr. Fordyce showed sixteen slides of cases.

He expressed thanks for having been asked to open the discussion. He trusted that what he had said would precipitate a discussion of Mr. Hovell's paper.

Mr. Hovell, in reply, said that Mr. Fordyce had spent a lot of time in the orthodontic team of the Royal Dental Hospital for some years past.

With regard to the remarks of Mr. Fordyce about buccal segments drifting forward before third molars were present, when second molars were pushing them forward, most of the cases that he dealt with occurred long before the third molars were present.

He had not dealt with transplantation, which was not his subject, and it was still in an experimental stage.

With regard to the frænum, he had said that provided the final result was achieved the actual technique did not matter. There were, however, certain principles to which one had to adhere.

Mr. Fordyce had raised an issue on the subject of the widening of the lower arch subsequent to a mandibular osteotomy and said that the tongue affected the lower arch and not the upper arch. That was exactly what one would have expected to happen. When one had an abnormality of skeletal patterning, the effect of soft-tissue morphology was that in the vast majority of cases the teeth were found to be tilted out as far as they would go and the tongue did not reach up to them but was underneath them. When the mandible was set back and the tongue was compressed in a smaller space, it could not tilt the upper teeth any more, but the lower teeth, now freed from the restraining effects of the soft tissues, were pushed out into a more normal position, both buccal segments and labial segments, which was as would be expected.

He thanked Mr. Fordyce for opening the discussion and for his very kind remarks.

Mr. G. C. Dickson said that a large proportion of the supernumerary teeth in the incisor regions that one saw were placed palatal to the central incisors. He wondered whether Mr. Hovell found that it was a small point in the operative technique that it was usually more comfortable for the patient if the supernumerary was removed via a palatal approach instead of using a cross-palatal approach and exposing the unerupted incisors labially. He suggested that the other method would avoid the discomfort of a rather sore palate.

Mr. Hovell, in reply, said that if the time for the eruption of the centrals had not yet occurred all one had to do was to remove the supernumeraries. If the centrals were superficial and there was a space for them in the arch, one should remove the supernumeraries and the centrals would come through.

He preferred to do the whole operation in one. He did not find that the exposure of the centrals gave the patient any greater discomfort. They were exposed not via the palate but from the labial side. He had not found that post-operatively the patient had a lot of discomfort.

Mr. J. F. Pilbeam asked Mr. Hovell how in the body mandibular osteotomy he tucked in the neurovascular bundle. He asked whether he cut a groove.

Mr. Hovell said that he did not cut it but let it go where it wanted to be.

Mr. Pilbeam said that one thing had not been emphasized, and that was that one wanted the right type of patient. He had been interested recently to read a series

of statistics published by Hoogman in America. The American had examined 171 cases which had been operated on during a period of 2-18 years, involving bilateral horizontal osteotomies and osteotomies to the vertical mandibular ramus. The summary of results showed that in 23.5 per cent of the cases there was unsatisfactory occlusion, 8.8 per cent had T.N. joint trouble sometimes, 38 per cent had facial nerve damage, and 38 per cent had inferior dental nerve damage. The extraordinary thing about those depressing statistics was that out of the total of 171 cases 97 per cent of the patients were perfectly satisfied with the operation and the treatment they had had.

Mr. Hovell, in reply, said that that was an astonishing fact. It was true that however disappointed he was with the results of a case he had yet to have a patient who was not pleased.

Mr. H. L. Leech asked Mr. Hovell what he considered to be the optimum age for body resection for mandibular prognathism. He wondered whether Mr. Hovell found that if he operated too soon in such cases he got any form of relapse.

Mr. Hovell, in reply, said that, with regard to the optimum age, he would say any age after mandibular growth had ceased.

He had not done a body resection upon a growing child for the simple reason that there was not usually enough body, even in a Class III case.

He had done an ascending ramus section on a child of 12 years. It had united and given a perfect result. Within two years the child was back where she would have been if he had never operated on her. In other words, the inherent skeletal pattern of the patient had re-established itself. That was only one case. He was not prepared to carry on experimenting with a lot more cases to see if it happened every time because the child aged 12, a Class III case, as she would have been if he had not treated her until 14 years of age, was now aged 21 and had had a body resection and was now no longer a Class III case.

Mr. C. Bowdler Henry said that he would be a very ungracious father if he did not feel paternal pride in Mr. Hovell, especially after what he had said about being his house surgeon and the tribute he had paid to his efforts to interest him in oral surgery. He had been along to St. Thomas's to see Mr. Hovell do one of the body osteotomies. Mr. Hovell had referred to the days before antibiotics when they depended on absolute cleanliness, asepsis, for the success of their operation. That was something which they achieved in those days, and it was something which he remembered with gratitude especially to those house surgeons who so diligently cleaned up the patients' mouths before the operations.

He recalled a case where a patient had had what he presumed to be a body osteotomy. She had had a very wide incision. She had certainly got her chin in relation to her maxillary in a good position, but now the woman, with no mandibular protuberance, had her chin right back in an almost straight line from the lower incisor apices down to her neck. At the same time she had an enormous balloon of cheek which he understood had already had one face-lift to try to get rid of it. In the meantime her very large tongue was pushing her lower incisors forward so that she was now getting a prognathism of her lower incisors which were almost in Class III relationship to her upper incisors. All surgeons who treated such cases should pool their information about successes so that they could learn what things to avoid.

It seemed to him that the patient to which he had referred had such a large tongue that instead of necessarily laterally expanding her lower arch she was also pushing the incisors forward. He thought in terms of some such cases of taking out a segment of the tongue as well as reducing the size of the jaw. He did not say that facetiously; he meant it literally.

Mr. Hovell had not referred to transplantation, and Mr. Fordyce had expressed regret that he had not done so. He did not know who else had been doing transplantations besides himself. They were, frankly, experimental. He hoped he might have the opportunity sometime of showing members the results of cases—he had shown some at the Royal Society of Medicine, but he now had some more—in which he had transplanted some developed teeth.

He felt that Mr. Hovell was guilty of an omission in not referring to the value—perhaps he had not had time—of the new apparatus at the Royal Hospital, the rotagraph for gauging the right position in height of supernumerary and buried teeth. The machine gave a panoramic view of the whole mandible in one stretch, which was of exceeding value, especially in relation to the supernumerary, because they were difficult to assess precisely, especially when obliquely placed, particularly with respect to vertical height in relation to the apices.

He showed a slide relating to the enucleation of the third molars in their erupting stage.

Mr. Hovell, in reply, thanked Mr. Bowdler Henry for his remarks. He said that he had not dealt with the diagnostic criteria for various types of operation, but there were cases where body osteotomy was wrong.

He had had one case in which he had done a body osteotomy on a spastic boy who had no occlusion and could not eat. The boy had a very severe mandibular dento-alveolar prognathism. He set back the boy's mandible, and he finished up rather like the case Mr. Henry had mentioned with little chin, and he had had to restore the chin.

With regard to the squareness of the face, he thought that that was a result which some people obtained in such cases by not tipping the posterior fragment. It was recommended that it should not be tipped in, but he did not agree with that. If one did not do it one got the horribly square face. He had not had any patients who had had discomfort through the tipping in.

He had been interested in Mr. Henry's radiographs of results of the enucleation of tooth germs, particularly the one where the seven was obviously drifting distally. It looked as if he had to eat his words when he said that a third molar did not have any effect on the teeth in front of it.

Mr. H. E. Wilson said that Mr. Hovell's frænectomy cases seemed to be done about the age of 8 or 9 or even 10 at the most. So far he had never yet found it necessary to recommend frænectomy. However, sometimes, where very late, he had found the frænum almost appearing to come away from between the teeth. Some people in America went to the opposite extreme and forcibly brought the teeth together, and they said that that caused strangulation of the frænum and it disappeared.

He had had an interesting case which helped to settle the matter in his own mind. It was that of a child where there was obviously a need for the extraction of two premolars, and that was done. At the next visit, there was a huge gap between the two incisors. It was only then that he noticed the frænum. It was a very large one, part

of which had gone between the two teeth originally in contact. He did not know what to do, and he did nothing. The patient was now coming back to normal again. Instead of the two segments being separated in the middle, they were now behaving as a normal case, and the diastema was now closing. So even at that stage it had had an effect in separating the two segments. Later on the frænum seemed to be coming out between the teeth, and was not, therefore, influencing the spacing of the incisors.

Therefore, would not Mr. Hovell delay doing the frænectomies until a later age when the permanent dentitions were fully developed and there was a greater degree of certainty as to whether the operation would be necessary or not?

Mr. Hovell, in reply, said that, as he had stated in his paper, he removed the frænum only when factors were present which would normally cause the teeth to close. When the lateral incisors were erupting and there was a space between the central incisors, if they became rotated and the space did not close, it was an indication for removing the frænum. If they were erupting in alignment, he would wait until the canines came through. He took it out only when there was an abnormality elsewhere in the arch produced by the persistence of the space.

He could not say that he had had such a happy result as Mr. Wilson had had of a frænum disappearing unless there had been a reason, such as the eruption of laterals or canines. If it did not close when the teeth were erupting, if they were excluded or misplaced, it was one's indication for the removal of the frænum. He had had the experience of teeth spacing most regularly after the taking out of the first premolars.

Mr. Lindo Levien, who said that he was rather mechanically minded, stated that he had not seen in the slide how the jaw was drawn together after the section of bone was removed.

Mr. Hovell, in reply, said that he wired the lower borders through the holes. The two sections were drawn together, and they were splinted in the pre-determined position by an intermaxillary fixation of the three segments and the upper splint, and a localizing device was used across the fracture line on each half of the splint.

The President said that not everyone agreed with everything that Mr. Hovell said on all occasions—even Mr. Hovell said that he himself had to eat his own words occasionally—but he was sure that no one could listen to Mr. Hovell without being impressed by his integrity and his courage and no one could go away after listening to one of his papers without being stimulated. The lecture that night had been no exception, and the size of the audience which had come to listen to Mr. Hovell was its own tribute.

Many of them during the course of their duty had to call on oral surgeons for various procedures, and it was much more pleasant for the patient and much more satisfying to them when they could call on someone who was expert in that branch, knowing that everything would be done to perfection with the minimum of disturbance both to the patient and to the patient's tissues.

Mr. Hovell had begun his paper by saying that he felt that everything was sure to go wrong. He could assure Mr. Hovell that everything had gone very right. The meeting was indebted to Mr. Hovell for his paper and to Mr. Fordyce for opening the discussion.

THE AGE FACTOR IN ORTHODONTICS

By G. G. T. FLETCHER, L.D.S., D.Orth. R.C.S.

ORTHODONTIC treatments are at best protracted affairs lasting months or more often years. The aim and object of those who treat dental or any other disability should surely be not only to obtain the optimum result but to do so in the minimum of time that skill and knowledge permit. This is particularly applicable to any therapy where appliances have to be worn. Orthodontic appliances may be neat and often ingenious but must nevertheless be considered an encumbrance and embarrassment to their wearers. Moreover, overlong use may produce harmful effects on the tissues to which they are attached or in near contact. Few patients, under any circumstances, would choose to wear appliances for any longer than is necessary.

As knowledge of the aetiology of malocclusion advances so the requirement for trial and error practical approaches should decrease, and it is possible, even with our present knowledge, to start treatment with a clear conception of the complete plan and prognosis in the majority of cases.

This calls for a re-assessment of what does or does not constitute a reasonable average duration for active orthodontic treatment.

As a result of holding these convictions, I began some years ago to focus particular clinical interest upon those treatments that had taken too long achieving too little. The purpose was to discover whether such lengthy affairs came about by necessity or not.

Through clinical observation of my own work and that of others, I gradually formed the view that prolonged appliance therapy was due not so much to patients' failure to co-operate or any intrinsic difficulty of their various orthodontic problems, but to errors of judgement on the part of the orthodontist himself.

Concurrent with the formation of this belief, and as a result of similar clinical observation, I noticed that the treatment of patients in the adult dentition frequently seemed to be

carried out both more effectively and speedily than that of younger individuals.

This led me to make an analysis of the treatment durations of orthodontic patients, with a view to ascertaining the relationship in terms of average active appliance duration between those treatments carried out in the adult and those in the mixed dentition. To collect the necessary figures for this investigation the records of 200 completed orthodontic cases carried out at the Eastman Dental Hospital were examined. These patients were unselected and the only qualification was that they had completed a full course of treatment, not limited in its objectives, and had concluded with a reasonably high standard of result. They had been attended by a large number of different individuals using a wide variety of orthodontic mechanical apparatus. The only common ground possessed by all the patients concerned was that their diagnosis was based on the same philosophy.

One hundred of these patients commenced their active orthodontic appliance treatment in the adult dentition and 100 in the mixed dentition stages. To be considered a mixed dentition treatment one or more deciduous teeth needed to be present at the time of fitting of the first appliance and treatment was deemed to have started in the permanent dentition if second premolars or second permanent molars had erupted.

It should be pointed out at this stage that interest centred on the periods in which appliances were being actively worn. Thus if a patient had a central incisor moved over the bite at the age of 8 and wore an appliance for a month for this purpose, then discarded all apparatus until having a final phase of active treatment at the age of 12, lasting 1 year, this would be considered as an active period of 1 year, 1 month, not 5 years. Pre- and post-treatment observation time was for obvious reasons excluded as was that of post-operative retention. The varying ideas of different

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orthodontists concerning how little or how much retention should be used are inconsistent, and the inclusion of retention time would interfere greatly with the clarity of the investigation. Finally it should be pointed out that the figures collected can only be regarded as relative and in no way represent the ideal.

The majority of the patients whose treatment times have been used were under the

This table shows that if an orthodontic treatment can be carried out in the adult dentition the chances of very much shorter duration seem much improved over cases commenced in the mixed dentition.

Table II indicates how apparently true this is of the individual as opposed to the average.

The argument will be put forward that not all can be left to the adult dentition stage, but

Table I.—COMPARATIVE ANALYSIS OF ADULT AND MIXED DENTITION GROUPS

General Analysis

STAGE OF DENTITION	MALES	FEMALES	OCCLUSAL RELATIONSHIP				DENTAL BASE RELATIONSHIP		
			Class I	Class II div. 1	Class II div. 2	Class III	Skeletal I	Skeletal II	Skeletal III
Adult	27	73	33	37	20	10	43	43	14
Mixed	35	65	23	54	10	13	37	45	18

Average Age and Treatment Duration

STAGE OF DENTITION	AVERAGE AGE AT COMMENCEMENT OF TREATMENT		AVERAGE DURATION OF APPLIANCE TREATMENT		AVERAGE NUMBER OF VISITS
	Years	Months	Years	Months	
Adult	13	8	1	8	30
Mixed	9	11	3	11	45

care of first- and second-year postgraduate orthodontic students working under supervision and other conditions necessary to a teaching organization, but not necessarily conducive to operative quickness. The fully trained and experienced operator working in his own private office should, therefore, think himself accursed if he cannot produce similar or better results in still shorter time.

The number of visits quoted are for all purposes throughout treatment, not merely for the active period.

Table I shows an analysis of the 100 adult and the 100 mixed dentition treatments, and also shows the average age at time of treatment commencement and duration of active appliance therapy for each group.

that some must be embarked upon earlier, because by so doing a patient's condition may be rendered treatable, which would not be so were it to be treated later; or alternatively, that the ultimate result of treatment would be greatly improved by such early interference. Such reasons might be considered the justification for early treatment, which would then be undertaken with the full knowledge that the overall time of treatment would be lengthened.

Even if the practical side of treatment of the patients to whom the figures refer was not carried out by experienced orthodontists the diagnosis in each case was, and it could be argued that this experienced diagnostician was in a position to select those who could benefit by early intervention and those who

could be safely left until the permanent dentition had arrived. The figures given in *Table I* could, therefore, be misleading, since the treatment times shown against both adult and

the shortest time, but the results shown on the record models appeared to be better than those of earlier age groups. How many times is an orthodontic problem, seen for the first

Table II.—ANALYSIS OF INDIVIDUAL TREATMENT DURATIONS

DURATION OF ACTIVE TREATMENT	UNDER 2 YEARS	UNDER 2½ YEARS	UNDER 3 YEARS	3 YEARS AND OVER
Permanent dentition (per cent)	61	14	9	16
Mixed dentition (per cent)	8	4	11	77

mixed dentition groups would merely represent the time necessary for a successful conclusion.

These same 200 patients were arranged in age groups so that the length of time taken for the treatment of each group could be examined.

time in the adult dentition, deemed incurable solely because of failure to obtain early treatment?

The answer to this cannot be found from the records of this investigation, as all the patients

Table III.—ANALYSIS OF AGE GROUP TREATMENT DURATION

AGE GROUP	AVERAGE TIME OF ACTIVE TREATMENT	NO. OF PATIENTS IN GROUP	NO. OF APPOINTMENTS
7-8 yr.*	4 yr., 8 mth.	13	48
8-9 yr.	4 yr., 0 mth.	19	40
9-10 yr.	3 yr., 7 mth.	19	40
10-11 yr.	4 yr., 2 mth.	26	50
11-12 yr.	2 yr., 7 mth.	29	42
12-13 yr.	2 yr., 1 mth.	29	36
13-14 yr.	2 yr., 1 mth.	24	38
14-15 yr.	1 yr., 7 mth.	17	32
15-16 yr.	1 yr., 9 mth.	14	30
16-19 yr.	1 yr., 4 mth.	9	30

* Includes 1 patient aged 6 yr.

It can be seen from *Table III* that the durations shown against each age group can be further divided into three main collective groups.

Those whose treatment was begun between the ages of 7 and 11 years show a duration of around 4 years; those commencing treatment between 11 and 13 years of age have a little over 2 years' active treatment, and from 14 upwards there is an expectation of the shortest period of all.

It is this last group that is of interest to question the arguments for the necessity of early treatment.

These patients of 14 and over presented for treatment with the adult occlusion already present. The choice of early treatment did not exist and yet not only were they completed in

contained therein had been treated successfully. Another survey would be needed to find out how many patients attending for the first time as adults had to be turned away on the grounds that they had become incurable because of failure to obtain treatment earlier. In the author's opinion orthodontic conditions are potentially treatable or untreatable, and failure to obtain early treatment seldom, if ever, alters this potentiality.

How many times does failure to obtain early forms of treatment lead to more difficult mechanical tooth movement later? Amongst the 40 patients starting over the age of 14 years that form the third collective group in *Table III*, there should be a few individuals whose treatment took well above the average

length of time due to increased difficulty that might have been eliminated by interference earlier. In fact the longest individual period of these 40 cases was one of 3 years, 2 months,

These patients by reasons of either advanced or retarded dental age were in the mixed or permanent dentition, but because of their chronological age they must be in either the

Table IV.—AGE GROUP ANALYSIS AT TRANSITIONAL PERIOD

AGE GROUP	PERMANENT DENTITION			MIXED DENTITION		
	No. of Patients	Active Treatment Period	No. of Appointments	No. of Patients	Active Treatment Period	No. of Appointments
9-10 yr.	1	1 yr., 9 mth.	37	18	3 yr., 8 mth.	41
10-11 yr.	5	2 yr., 3 mth.	32	21	4 yr., 7 mth.	54
11-12 yr.	11	1 yr., 8 mth.	36	18	3 yr., 2 mth.	46
12-13 yr.	23	1 yr., 10 mth.	32	6	3 yr., 2 mth.	50
13-14 yr.	20	1 yr., 10 mth.	35	4	3 yr., 2 mth.	48
	60			67		

well inside the average for the mixed dentition. This was the only one of these cases to exceed 3 years; of the remaining 39, 28 completed the required tooth movements in under 2 years. Although the number of patients involved in

late mixed or early permanent dentition stages. The awaiting of tooth eruption should here, therefore, be reduced to a minimum. It can be assumed that the last permanent teeth, excluding third molars, have either just erupted or

Table V.—GENERAL ANALYSIS AT TRANSITIONAL PERIOD

	NO. OF PATIENTS IN GROUP	AVERAGE PERIOD OF TREATMENT	NO. OF APPOINTMENTS
Patients in permanent dentition	60	1 yr., 10 mth.	33
Patients in mixed dentition	67	3 yr., 9 mth.	45

this group is comparatively small, the indication is that very few exist that become so complex that they suffer in terms of time by being left to the permanent dentition stage; it might be admitted, however, that total chairside time for adult treatments may be slightly increased.

It has been said that the time to start orthodontic mechanical treatment is in the very late mixed dentition stage. By so doing some local tooth movement can be carried out whilst the eruption of the remaining permanent teeth takes place concurrently.

Clinical observation has made me question this and Table IV was prepared, still using the records of the original 200 patients, but focusing on the second collective group in Table III. These are patients whose treatments were commenced between 11 and 14 years of age.

are on the point of eruption. Table IV shows the relationship of the length of time of treatment between those patients who had reached the adult occlusion and those that were still in the mixed at the time of fitting the first appliance in these transitional age groups.

It will be seen from Table IV that 127 out of the full 200 investigated have commenced treatment during the final change-over period from mixed to permanent dentition, which is an indication of the popularity for the belief that this is the best period to start.

It can be assumed that a large proportion of those patients who attended sufficiently early to present the orthodontist with a choice in time of commencement began their treatment at this stage if the temptation for giving even earlier treatment was resisted.

The overall average length of treatment for all these patients is given in *Table V*.

It can be seen from *Tables IV* and *V* that even at this popular age for treatment commencement it is those patients that have reached the adult dentition that have their treatment shortened whilst those that have not quite reached that stage still flounder.

It is plain from these figures that treatment commenced in the mixed dentition will on average lead to a protracted affair and that this is equally true even of the very late mixed dentition commencements. Only with the arrival of the full permanent dentition does treatment time shorten to reasonable proportions.

On the evidence of *Tables IV* and *V* the period of awaiting tooth eruption when working on the mixed dentition cannot clearly be the only factor in producing their increased duration, and one must look for further reasons.

For further evidence of other possible causes my attention was turned to reviewing the case records of these 200 patients in retrospect, in an attempt, thus endowed with the ability to be wise after the event, to discover any recurring reasons for prolongation.

It appeared certain from these records that the main causes lay partially with failure to elect the ideal time for commencement, but principally to such matters as failure to assess the patient individually, diagnostic and treatment planning indecision and inept, inaccurate, or inadequate mechanical methods.

Theoretical and practical inaccuracies and piecemeal planning lead to prolongation no matter at what stage of the dentition treatment is inaugurated. Previous clinical observation supported by the evidence of these records causes me to believe that liability to such errors becomes less once the adult dentition is reached and that the logical reasons for this can be shown by reviewing some of the salient features of diagnostic, mechanical, and patient problems as they relate to mixed or adult dentition assessment and treatment.

PATIENT

Orthodontic patients frequently have a vital responsibility in their own treatment. It is

essential for this that they are capable of intelligent co-operation and are willing to carry out whatever may be required of them through a sincere desire to obtain a speedy and successful outcome. The co-operation of the parents is helpful, but in the long run it is the enthusiasm, or lack of it, on the part of the patients themselves that is the deciding factor in contributing to ultimate success or failure. The older patients are more likely to seek treatment as a result of their own personal desire for it, and if reasonably intelligent will understand explanations of what is involved in the treatment of their condition and can express an opinion of approval or otherwise, thereby greatly assisting the judgement of final objectives when forming a treatment plan.

The willing co-operation of such older persons is infinitely more satisfactory than the docile subservience of the child too young to express himself and knowing nothing of the reasons for wearing a mouthful of wires, but who is carried forward by the enthusiasm of the parent.

MECHANOTHERAPY

From the practical mechanical aspect of treatment in the mixed dentition, early loss, root resorption, and exfoliation of the deciduous cheek teeth reduce the anchorage available to negligible proportions and consequently slow down the rate and quantity of tooth movement that can be undertaken safely at any given time.

The arrival of the full permanent dentition provides the orthodontist with firmer and more extensive anchorage against which multiple tooth movements can be carried out, at the same time making the risk of inadvertent movement of the wrong teeth by reciprocal action less likely.

The presence of the permanent dentition with its increased available anchorage makes the edgewise or modified edgewise multiband appliance systems applicable to all segments of the dental arch, and it might be thought by some that it is the use of these complex mechanisms in later treatments that are mainly responsible by their multiple and highly

positive actions in reducing the time-factor for the whole of the adult treatment group.

Table VI shows an analysis of the 100 permanent dentition treatments from the point of view of the duration of active treatment in relation to the type of appliance used.

As might be expected, the treatments carried out completely by multiband appliances are

orofacial musculature upon tooth positions have been two major factors in advancing the diagnosis of malocclusion in recent years. From a study of these two main factors, allied to observation of individual tooth position and size relative to the extent of the tooth-bearing tissues, the orthodontist is now in a position to predict with increased accuracy the final

Table VI.—TREATMENT DURATION OF ADULT GROUP RELATED TO APPLIANCE METHOD

TREATMENT METHOD (APPLIANCES)	NO. OF PATIENTS	AVERAGE DURATION OF ACTIVE TREATMENT
Multiband	37	1 yr., 5 mth.
Part multiband, part simple fixed or removable	20	1 yr., 11 mth.
Simple fixed or removable	43	1 yr., 11 mth.
	100	

shorter than those resolved by other methods. The six months' difference between the time taken by multiband as against simpler techniques, as shown in Table VI, would have been smaller, were it not for temptation to save work, and the objection by some patients to wearing bands on their teeth. This has led in some instances to the hopeful use of simple apparatus to attempt to carry out tooth movements for which they are mechanically inefficient or incapable.

Multiband type appliances are particularly suitable to effect such movements as rotations, changes of axial inclination, bodily root movement, and extensive space closure where these occur in multiple fashion in the same malocclusion. Simpler apparatus is applicable to those treatments demanding predominantly tilting actions.

Provided that this is borne in mind when planning treatment, there is seen to be a requirement for both categories of appliances and each will carry out treatment with equal rapidity so long as, while realizing the need for maximum simplicity, the simple type appliance is not expected to exceed its mechanical capabilities.

DIAGNOSIS

Cephalometric analysis and a greater realization of the importance played by the influence of variations of pattern and behaviour of the

pattern that will emerge from a malocclusion seen in a patient at an early age. There is, however, not yet unanimity of opinion that such knowledge is infallible.

Doubt has been expressed as to whether the pattern of development of the facial skeleton remains constant and in harmony with early cephalometric measurements, or whether there may not be small variations, for example, in the matter of growth direction, or the rate of growth.

Again, the exact forces produced by muscular activity are difficult to assess by direct measurement. The direction of contractions of each muscle conforms to a universal anatomical pattern, but the contractions differ in the degrees and dispositions of their pressure influence on neighbouring structures from individual to individual. Even if clinical assessment of these muscular influences is correctly made in the mixed dentition stage, there is the possibility that through maturation and the superimposition of an increasing amount of conscious control, the adult balance might not be exactly the same.

Even if it is assumed that muscular influence remains constant, there is the fact that the dental arches vary quantitatively and qualitatively during the change from the mixed to permanent dentitions and might react differently to the same environment. If these or

any other potential sources of early error could give rise individually or collectively to a misjudgement of the final adult arch capacity of 2-3 mm. this could lead on occasions to the need for complete re-assessment and re-treatment, or the acceptance of a substandard result.

The statistical figures given earlier were collected and compiled in order to ascertain whether in fact the average duration of active appliance therapy could be expected to be longer when commenced at some stage in the mixed dentition. Their evidence is clear on this

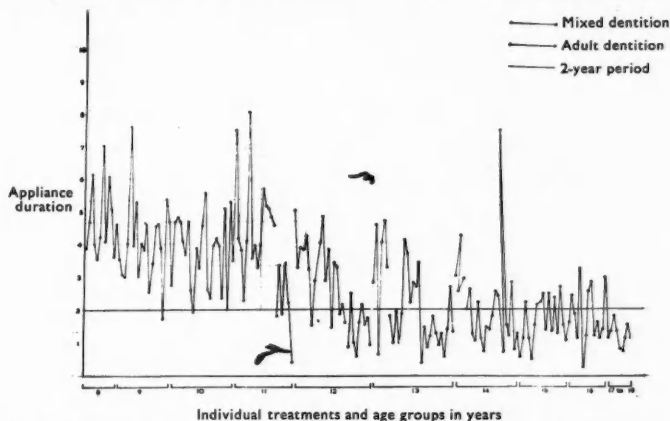


Fig. 1.—In the original graph the lines connecting the individual plots of the adult and mixed dentition treatments were of different colours. Although this aid to interpretation is lost in black-and-white reproduction the graph still shows the gradually decreasing duration and tendency to fluctuate of the active orthodontic treatment times as the patient gets older. The vertical fluctuations will tend to decrease the more trial-and-error methods and assessment are replaced by diagnostic and treatment measures of greater certainty.

Bearing in mind that the practical orthodontist must work in millimetres and degrees, diagnosis and treatment planning supporting treatment commencement must be completely accurate if it is to be of more than largely academic interest.

There is a real danger of building up a treatment on an early false assumption which in turn falsifies subsequent action. The truth may not be discovered until much valuable time and energy have been spent and the mocking sight of relapse pronounces the necessity to retreat from the beginning on different lines.

Treatment planning becomes surer and more objective when the full adult dentition has been present for long enough to have overcome its initial instability and all the factors in the final adult dental balance have exerted their respective influences on one another and the effect of this can be seen and judged on its clinical merits.

point but must be regarded only as an indication and not as proof, since they have been compiled from the records of a comparatively small group of patients at one hospital (Fig. 1).

It is certainly not the purpose of this paper to suggest that by commencing in the adult dentition, treatment is in any way automatically shortened, or that prolongation is the inevitable sequel to commencement in the mixed dentition.

CONCLUSIONS

1. If the overall time that appliances have to be worn is to be given due consideration, the occasions when early interference are justified by necessity are comparatively rare. Too frequently early treatment, particularly in patients of 9 years and under, is a system of punctuated progress from one stage to the next, providing a lengthy substitute for the more objective, continuous, and concentrated adult route.

There is an urgent need for more study into the value of all forms of early treatment to investigate thoroughly as to which merely provide a lengthy substitute for later treatment and which, in what circumstances, and precisely to what effect, justify their employment in any given case. Effect should be commensurate with duration, and acts of God and acts of appliance segregated beyond doubt.

2. Study of these 200 case records and their statistical analysis has suggested strongly that not only is early interference frequently superfluous, but also that at all stages of the mixed dentition there is an increased liability to error. Some logical reasons have been suggested why, before the arrival of the permanent dentition, there is an increased risk of failure in assessing the patient personally, of mechanical stultification, blunder, and diagnostic oscillation. Any error of judgement in any of these departments need only be small to result in a considerable increase in appliance duration. Throughout this paper reference has been made to those treatments aimed at achieving the optimum standard of result, and not to those modes contrived to circumvent social and circumstantial difficulties by short-circuiting the true time requirements of a condition by the acceptance of a limited standard of result or by any leaving to chance.

DISCUSSION

The Chairman thanked Mr. Fletcher for a most interesting paper, one which was most salutary. He was sure it was a very good step towards analysing the time spent in orthodontic treatment of patients. He wondered if hospitals were the best places for such an investigation as he knew how easy it was, with no Dental Estimates Board to placate, to put in another appliance and perhaps use more than one should. He wondered also if they were not being beaten by the educational system, because so often though a patient might spend only a quarter of an hour in the chair it meant spending a half-day away from school; that was one of the controlling factors, the other being that one had to equate the educational demands of the eleven-plus examination and the best treatment.

The Chairman asked Mr. Mills to open the discussion on Mr. Fletcher's paper.

Mr. Mills congratulated Mr. Fletcher on his paper. It was seldom the Society had a paper that so directly helped the members in their practical treatment of their patients.

Emergency orthodontic measures must and do exist to cover social and economic demands that prevent pursuit of the ideal, but the present-day weight of these demands should not obliterate consideration of what is ideal.

It is possible that many forms of early treatment owe their continued existence in this country to an attempt to overcome social and economic difficulties. By their use it is hoped that more patients can be under treatment in one place at one time, that cost can be reduced or dissipated, and method simplified, so that circumstantial problems can be met without sacrificing the standard of result.

If, however, there is any truth that mixed dentition treatments take, on average, twice as long as the adult, then the younger patient has an expectation of a tedious journey towards successful conclusion. If the conclusion is unsuccessful then he must be satisfied with the interest of that journey.

The patient is entitled to at least the option on the surest and also the quickest treatment available. If we as orthodontists must lead him for years through dark woods of honest ignorance, we must not be surprised on stumbling into the light, if we find, on occasion, that he apparently possessed less faith and fortitude than ourselves and has given up ungratefully through exhaustion and disappointment.

Most orthodontists felt that they ought to treat their patients as young as possible. They felt that in that way they might intercept the malocclusion before it became fully established and might even make use of natural growth forces in its correction. Moreover, it seemed wrong to allow the patient to suffer the psychological trauma often produced by unsightly teeth, to say nothing of the risk of actual physical trauma. Nevertheless, very often these cases drifted on for years and produced a patient with little interest or enthusiasm. Mr. Fletcher had crystallized the situation and had shown that treatment in the mixed dentition took twice as long as treatment in the permanent dentition.

He was surely right when he had said that our shortcomings lay primarily in diagnosis and treatment planning. Mr. Mills had a dislike of cases in the mixed dentition. If he treated them he felt that too much was being left to chance. He seldom knew just how the case would develop in the way that one knew with the permanent dentition. He hoped the day would come when our greater knowledge—particularly of growth and

development—would enable us to treat cases successfully and permanently in the mixed dentition. He was sure that this was the best time from the patient's point of view. For the present, however, we must recognize our limitations and treat at least the majority of cases in the permanent dentition.

There was always a tendency in statistical investigations to lump together conditions which were not strictly comparable. He was sure that Mr. Fletcher would agree that a proportion of cases were better treated in the mixed dentition. He felt that these were almost confined to cases involving a bite of accommodation; in particular, cases with an odd incisor inside the bite, certain postural Class III cases, and cases of unilateral cross-bite which involved a bite of comfort.

Mr. W. J. Tulley added his thanks to those of Mr. Mills for Mr. Fletcher's most interesting and straightforward paper. He found himself largely in agreement with Mr. Fletcher, which was rather disappointing, but even so there were one or two points he would like to raise.

Mr. Fletcher had discussed merely the problem of treatment in the mixed dentition as opposed to permanent dentition, and there was still a considerable body of opinion in the country which believed that one could do useful treatment in the complete deciduous stage, a concept which Mr. Tulley could not condemn too strongly.

Some years ago he had commenced treatment for a lot of children at the ages of 3 and 4, and some of them were still with him in their teens. Those who were not might well have cured themselves anyway. He thought that most active treatment in the deciduous dentition was a complete and utter waste of time.

Another point was that Mr. Fletcher had been talking mainly about fixed appliance technique. Mr. Tulley would have liked to have known a little about the duration of each visit, but he realized the difficulties of analysing such things. That was something which had to be taken into account in weighing up fixed and movable appliance therapy; the surgery time was important. He would have liked an analysis of the type of cases Mr. Fletcher was dealing with. There again statistics could give a bias.

The period of the late mixed dentition was obviously the most popular because so many of our treatments involve reducing the number of permanent teeth, frequently the first premolars, which did not erupt until 10. One did not like surgically removing them too frequently.

However, it is most important that orthodontists should be given the opportunity of seeing children at an early age and seeing the dentition growing up. They did not want to train orthodontists who did not start to see children until the age of 12, and he was sure Mr. Fletcher would agree with that.

Mr. O. N. Catchpole said he had been taught that there were two advantages of treating the child young. One was that if a tooth had to be rotated it stayed in position much more easily if it was done before the tooth was fully formed, so that a portion of the root was formed in its new and proper position. The other was that sometimes there was damage to the teeth as a result of wearing fixed apparatus. If the work was done during the life of the deciduous teeth and the fixed apparatus was fastened to the deciduous teeth, that damage went when the teeth were shed and the permanent dentition had a clean fresh start.

Mr. A. G. Taylor asked on what basis were the cases selected. Were they a consecutive series of cases? They

appeared to be the type of case that would be referred to hospital for specialist consultant treatment rather than the common round of orthodontics one would find if one took 1000 consecutive children in a school.

Mr. J. C. Ritchie said that there was no mention made of any treatment under the age of 7 years. That seemed to imply that at the Eastman Dental Hospital treatment was not carried out at that age. "These lumps of protoplasm", as Mr. Fletcher had called them, were to Mr. Ritchie some of his best patients and some of his best friends; he thoroughly enjoyed treating them and was very glad to see them every time they came in. He could not agree with Mr. Fletcher that to treat orthodontic cases in the temporary dentition was a great mistake. He had carried out many treatments in the temporary dentition which had shown no relapse whatever, and he was thinking particularly of the Class III malocclusion.

He had had the privilege of treating a set of uni-ovular quadruplets—probably unknown in the history of this country before—who all had a Class III malocclusion. The first time he had seen them was when they were about 4 years and 9 months old. In the space of 15 months each child had achieved a normal occlusion. He hated to think what sort of an orthodontic problem they would have made at the age of 13 years.

Mr. H. G. Watkin thoroughly agreed with what Mr. Fletcher said; he thought it was important to see the child early and to take impressions. Then to see the child again in twelve months and commence treatment, if such is indicated. It was most important that impressions should be taken and studied early.

Mr. T. Jason Wood asked Mr. Fletcher to comment on two very simple forms of treatment which he had found most useful. In the congenital Class III he did not think extra-oral traction could be started too soon and had even been started with great effect at 2 years of age.

The other simple treatment was most applicable in the mixed dentition period described by Mr. Fletcher on being likely to prove lengthy. The oral screen was most useful in improving lip relationship and incisor relationship while awaiting the eruption of cheek teeth, and frequently little was then left to be done but make room by extraction. The appliance was easily worn at night only, by the child, who usually readily co-operated if it was explained that much full-time appliance wearing later on would be saved.

Mr. E. J. R. Bird asked if Mr. Fletcher had found any difficulty with the adult dentition-treated children who leave school at the earliest possible moment. He found sometimes they would go to him and tell him that they had left school and did not want to carry on the treatment, even though they may be half-way through their treatment. He considered that to be one of the greatest snags in treating the 13 and 14-year-olds.

Mr. Fletcher said that there were a number of circumstantial matters, such as schooling, which had to be taken into account. Individual circumstance had to be treated on its merits and related to the type of treatment involved. These circumstantial problems were an integral part of treatment planning. One would be unwise to be dogmatic about commencing treatment at any particular age but if one allowed circumstances alone to cause one to start treatment early against one's better judgement, patient and parent should be informed of the likely consequence to the overall time.

Mr. Mills had raised a point with regard to physical trauma to upper incisor teeth in Class II, division 1 malocclusion as to whether early treatment was not

justified in this type of case to offset liability to fracture. Mr. Fletcher said that there were undoubtedly some cases where this could be done safely and without time wastage, but again one could not be dogmatic, because there were other types of cases where early intervention would be singularly ineffective. He cited as an example a Class II, division 1 malocclusion on a Class II dental base with incompetence of lips and incipient buccal crowding. In such a patient the overjet could be reduced only very slightly without fear of impaction and so forth. This overjet reduction would be too small to make any difference to possibility of fracture should this patient fall on his face.

Mr. Fletcher agreed with Mr. Mills that the incisor behind the bite and lateral cross-bite were conditions worth while treating early if diagnostic factors permitted and natural retention existed.

On Mr. Tulley's point with regard to the duration of visits, Mr. Fletcher said he had not investigated this because the cases used for the compiling of the statistics were almost all treated by first and second-year post-graduates who might spend several hours in the construction of one band that could be passed as satisfactory by his instructor. To discover average chairside time involved, more experienced operators should be used to provide data. Mr. Fletcher said he would volunteer the information that a full band up involving all the teeth of both arches would require at least six hours' chairside work.

Mr. Fletcher agreed that orthodontists should have the opportunity to see their patients before the age of 12. A great deal could be learned by watching general development in growth and maturation, and, additionally, local development by observing the natural behaviour of teeth as they settle into equilibrium unhindered by appliance.

In reply to the question about the type of case, Mr. Fletcher said that his first table had shown that a good cross section of all the malocclusions had been used to compile the statistics. He was not sure whether this was the answer Mr. Tulley required or whether by "type" he meant social category.

Mr. Tulley said he had wondered whether they were teeth inside the bite or malocclusions.

Mr. Fletcher said they were full malocclusions. Some were simpler than others, as one might expect if no selection were involved, but all had been treated up to the requirements of their conditions.

In answer to the question as to whether early tooth rotation before the apex was closed resulted in increased stability, and to the question as to whether early appliance wearing was desirable on the ground that trauma would be confined to the deciduous teeth, Mr. Fletcher said that he did not think any increased stability was to be had purely by rotating the tooth early. On the second question he said that he supposed that if one was unable to treat orthodontic patients without producing trauma then it would be best to confine it to the deciduous dentition, or better, give up orthodontics.

In reply to the question as to whether the cases were extraction cases or not, he said that a large number were, and a large number were not. The cases were just the sort one would meet with in any clinic or practice. A few had been very difficult ones referred for specialist treatment because no one else dared face them, but most were perfectly ordinary malocclusions such as one would meet anywhere. None was treated by extraction alone.

Mr. Ritchie said that his very young patients seemed to get on all right, and he enjoyed treating them. Mr. Fletcher asked Mr. Ritchie if he were sure his patients enjoyed being treated. Mr. Fletcher said he had been an orthodontic patient himself and had suffered four and a half years' early treatment which turned out to be ineffective. He had been polite to the practitioner concerned only because he was well brought up and too young and inexperienced to say what he really thought. He was sure Mr. Ritchie could produce results, because he had worked with him, but was he sure that he need start so young? Mr. Ritchie had said that Class III cases respond well to early treatment and this agreed with what Mr. Mills had said. With regard to the use of chin-straps, Mr. Fletcher said that these might achieve some local tooth movement which would be beneficial but he doubted their claim as regards skeletal development. In patients that had seemed to benefit he thought it possible that a claim was being made for what would have happened anyway.

The optimum time of treatment was a matter of individual assessment. Obviously it would be right to start treatment sometimes in the mixed dentition. For the majority the age would be, if one could wait so long, not only when the adult dentition was there but when it had been there for long enough to have settled into final equilibrium, and initial instability had been eliminated.

Someone had mentioned that late treatment may well interfere with schooling and that sometimes the patient left school before treatment was finished and decided not to continue. This was a good example of the sort of thing one was duty bound, if possible, to discover before treatment was started. Such circumstantial matters comprised what he had referred to in his paper as patient assessment and this often had a profound effect towards limiting objectives when planning treatment. Mr. Fletcher then cited an incident that had occurred at the Eastman Dental Hospital where a patient announced that the family were going abroad for three years a fortnight after commencement of treatment. This could have been discovered by sensible questioning beforehand. Since there was no orthodontist in the particular part of the globe to which the patient was going, here was a circumstance of sufficient gravity to cancel any form of projected treatment at least for the time being.

Mr. Watkin had advised taking an impression early. Although Mr. Fletcher had not mentioned that, he did agree that it should be done. One must have something for the purpose of comparison; one could not remember after seeing a great number of other patients the exact details of any particular dentition.

He thought he had answered Mr. Bird when dealing with another question. One should find out everything circumstantial that might have the effect of limiting the objectives in treatment beforehand. As a rule, if the patient was really keen, they could usually find a way by which the treatment could be completed.

The Chairman thanked Mr. Fletcher for a most instructive paper.

Reverting to the point about length of treatment, he knew adults who would come 15 or 16 times a year for 2 years, whilst others in the mixed dentition would come about 11 times a year for 4 years.

He thought some of the dental students who had started as patients had been among their best cases.

The discussion had been very good and left the members with much food for thought, and he thanked everyone who had joined in.